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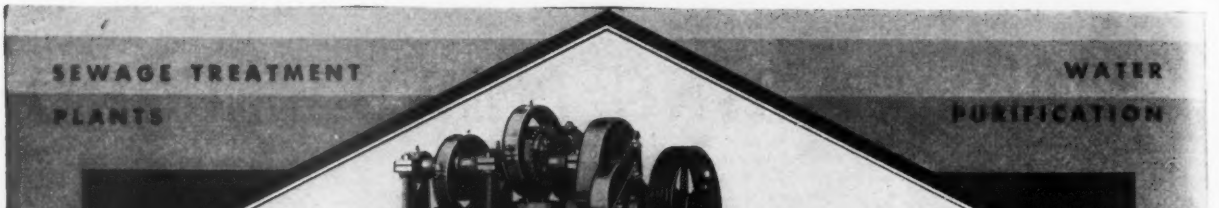

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 106 NEW YORK, MARCH 19, 1931 Number 12

Delay

CONTROVERSIES, red tape, political grievances and legal snarls are holding up millions of dollars worth of authorized public-works construction that ought to be under way at this time. In some instances the delays are proper and unavoidable, but in many others concerted effort and cooperation on the part of all concerned would soon put the projects into the actual construction stage. The season is rapidly approaching when construction should be in full swing if it is to do its share in unemployment relief and business revival. In New York State a huge grade-crossing elimination program is being retarded because of the recently passed Dunmore act providing that contractors on this class of work pay prevailing rates of wages and work but eight hours daily. Railroads contend that the provisions of the act increase the cost of work 25 per cent and are holding off as long as possible. A $2,000,000 subway contract in Philadelphia has been held up two years, first by suit of the disqualified low bidder and then by dispute between the contractor and engineers over methods of conducting the work. Now, further delay is threatened by a political investigation. Chicago's hopes of early start of actual work on its subway are dashed by delay in special assessment proceedings. These are but a few instances of public works being delayed. The situation demands common-sense cooperation for quick remedy.

Great Achievement

WHEN fourscore men of high rank in engineering and public life met last week to honor J. Waldo Smith on his seventieth birthday they expressed something more than admiration of a great engineer and affection for his human qualities. They honored the organizing ability which he displayed in his work—the essential magic of his achievement; and rightly so, for the power to gather together a group of able men and inspire them to best cooperative effort is the crucial factor in the building of every great work. It truly built the Catskill enterprise. Could it but be taught, it would be the highest art included in the instruction of engineering students. But since it lies in spirit and manner, not in method, it is bound to remain evanescent, as intangible as the power of persuasion or the gift of charm. By contemplating the example of those who possess organizing power in highest degree we may perhaps win some of its secrets. J. Waldo Smith will long be the great inspiring example to his younger colleagues; may he live to fire their enthusiasm and yield to them a fraction of his skill. As engineering tasks grow greater, this power ever more is needed in the engineering world. And, fortunately, the Catskill work does not stand alone in latter-day engineering history. Such strong groups as that which built the Miami flood-protection under Morgan, the Delaware River bridge organization under Modjeski and Webster, the Hudson River tunnel under Holland, show that civil engineering is not without its leaders and its great organizers. And each group of the kind scatters its seeds of engineering inspiration over the country, as did the Catskill and the Boston water undertakings. Engineering needs more organizers. May the coming generation supply them.

Warning From Experience

IN 1905, when the Catskill system was begun, said J. Waldo Smith at his anniversary dinner, the water supply of New York was in an anxious situation; and a like situation exists today. That remark contained a warning more important than the simple statement of its author might suggest. In 1905 New York's need for additional water supply was urgent, far more urgent than the ordinary citizen could realize. It was again urgent a dozen years later, when the Schoharie extension had to be built. Today there is equal need for the further supply to be taken from the Delaware headwaters, and this is the background of the anxieties that attach to the case now before the Supreme Court to determine whether these waters may be used despite New Jersey's objection. Nearly ten years elapsed from the beginning of the Catskill work until its water reached the city; great reservoirs and aqueducts take a long time to build, and each year consumption grows and drought may strike the country. But New York's needs are not unique. Many large cities are close to the limit of their water resources, and face a similar prospect of years of construction before they can have more water. The 1930-31 drought reveals the narrowness of the margin and supplies a sensational argument for active planning of additional supplies. Its lesson may soon be forgotten by the public, however, and there may be difficulty in getting authorizations and appropriations after preliminary studies are completed. Organized engineering sentiment can do constructive work at this juncture by supporting water-supply projects with the strength of impartial expert opinion and by working for public recognition of long-time water planning.

Water-Supply Sufficiency

WERE it possible to calculate exactly a city's water needs and the minimum yield of its watersheds, the planning of extensions would be relatively simple. But these quantities, particularly the latter, are variable. Consider the situation confronting the responsible head in any city dependent upon a stored water supply during a long-continued dry period. With a known rate of

consumption, a fixed storage capacity and a record of past watershed yields, comparatively simple calculation may give assurance that the system can weather the worst recorded drought with a definite, though small, margin of safety. But what of the present drought? It may or may not prove more severe than any previously known, and it is impossible, before the event, to date its termination with sufficient accuracy to justify utilization of the last few gallons in the reservoirs. A forced decrease in consumption through reduced pressures, the elimination of non-essential uses and other expedients mean general dissatisfaction, inconvenience and monetary loss. Quite properly such measures are adopted only when they can no longer be avoided with safety. But when is this point reached? No man wishes to cry "Wolf! Wolf!" when there is no cause for alarm, but who can accept without a qualm responsibility for a city without water? The possibility is, of course, unthinkable. Yet, until the general public shall be convinced of the necessity for water reserves which, under ordinary conditions, may seem unnecessarily ample such situations will continue to recur. Reserve supply and storage cost only a trifle per capita—investment that returns golden dividends at a time like the present.

Fifty Miles and Licenses

ONE state legislature has just been considering a bill that would fix 50 miles per hour as permissible road speed. Two dozen states still without drivers' license laws are considering such laws in their present sessions. Both facts bear on road safety conditions. We are "speed mad," old timers might say, but the plain fact is that high speed is a necessity of modern road service. Yet many authorities and their constituencies are unwilling to institute even a superficial weeding-out system. Speeds of forty or fifty miles per hour are obviously not meant for the unfit. At least the halt, the ill-adjusted and the blind or color blind should be kept off the road. Yet Illinois killed a license bill only two years ago. It is considering a license law again, and this year the bill may pass; the rural districts, which opposed the former bill, have experienced a heavy accident increase, and now may pass a real safeguarding law, such as the uniform bill of the National Conference on Street and Highway Safety. Strangely, some misguided motor-club enthusiasts still urge substandard laws, lacking the features of examination and enforcement; but the record of 29 per cent lower accident rate in states with standard licensing will in the end prove an irresistible argument. The plan of licensing every applicant and recalling the licenses of offenders has not proved effective; better a license law with teeth, or none at all.

Broader Interests

DR. ROBERT A. MILLIKAN, the physicist, expressed an opinion in a recent address before the Phi Beta Kappa Society which has broad connotations for every engineer. The exact statement applied narrowly to the audience he was addressing and included the suggestion that Phi Beta Kappa, the honorary scholastic society, combine with Tau Beta Pi, the scientific honor society. In broad meaning, however, Dr. Millikan was only expressing what many educators are coming to feel—namely, that overspecialized knowledge is harming scientific men. In the fundamental sciences—mathematics, physics and chemistry—and their many practical applications modern scientists and engineers have never been so efficient. In subjects, however, which involve ways and means of adapting oneself to an environment, such as history, literature, ethics, languages and economics, the scientific man is sadly lacking. This lack is to his own detriment. Civil engineering has always been a profession of widespread interest. As time goes on these interests must become broader, in fact they have become so in the past decade. New fields of engineering work take the engineer into regions and human contacts that are entirely strange. The engineer often becomes a man of affairs, a business executive, a diplomat, a politician, an envoy to foreign countries, a molder of public opinion. He has need for a broad education. The engineering colleges must sooner or later recognize the fact. And every engineer must realize its necessity of it and direct his thinking and studying along broader lines.

Prequalification vs. Bidding Fees

THE symposium on estimating fees published in our pages five weeks ago deserves the unprejudiced attention of organized contracting. The suspicion, distrust and ill will which the plan has aroused among owners and engineers seem likely to offset any possible advantage that may accrue to contractors. No action which causes an unfavorable attitude on the part of those with whom contractors must deal in securing work will help contracting.

Two main reasons for the fee system are given by its sponsors. Its primary purpose, they claim, is to reduce the bidding list on every project, thereby effecting a major saving to the contracting industry by eliminating useless estimating. This saving, it is claimed, will revert eventually to the building public. The second purpose, advanced more by individual contractors than by their associations, is that unsuccessful bidders will be reimbursed for the expense and trouble of bidding. In the light of the opposition expressed, the estimating fee system is too unsound and open to suspicion to be justified by either or both of these arguments.

Obviously there are too many contractors in the field for the good of contracting or the building public. But it is the quality of the surplus contractors and not the quantity that is objectionable. Prequalification will reduce the surplus more effectively and will bring forth better conditions within the contracting industry than can possibly be brought about by a system of charging estimating fees. The bidding fee system will not eliminate the irresponsible contractor. If an owner restricts his bidding list to six, for example, there is no assurance by this act that one or more on the list will not be of the irresponsible class. Another argument used by those sponsoring the fee plan is that something must be done to penalize the owner or architect who calls for bids merely to obtain an estimate of cost, without any intention of awarding a contract. We agree. But charging estimating fees will have no effect in such cases. No fees are available unless a contract is forthcoming.

Furthermore, is it not manifestly unfair to the public to increase the cost of public works by charging estimating fees? In most instances the law forbids restricting bidders on this class of work except by prequalification. Some contractors' associations recognize the injustice of the plan on public works. That others do not is evident from recent news from Dallas, where the school board

rejected all bids on a new building because the bidders included an estimating fee.

The suspicion of engineers and owners that back-stairs methods are used at times in applying the fee and that it is possible to bid merely to collect the fee is apparently well founded, according to the symposium published Feb. 12. Regardless of how rarely such instances actually occur, their possibility will go a long way toward creating a distrustful attitude in the minds of engineers and architects. This attitude, strengthened by further suspicions of price fixing and collusion, will work to the detriment of contracting. Intimidation and coercion against contractors opposing the plan, reported in the symposium, drag contracting in such instances down to the level of plain racketeering.

Prequalification is a solution to the problem of useless and excessive bidding. There is no economic loss to the building public by having a list of any length of reliable contractors. Supporting and cooperating with organizations such as the Contractors' and Surety Companies' bureau of contract information in an effort to establish prequalification as an accepted procedure in calling for bids will do contractors and their industry far more good than will attempts to advance a plan as open to suspicion as is the estimating fee system.

Better Steel Rails

HOPE for the production of heavy rails of high and uniform quality is advanced by an announcement of the completion of plans for joint research work by the American Railway Engineering Association and the rail manufacturers for the purpose of determining the causes of transverse fissures and other rail defects, for developing means of eliminating them, and for improving the quality of rail steel. Announcement of this projected research serves as a reminder of the uncomfortable fact that steel rails long have been a source of trouble and doubt in railroad service, both as to their physical and as to their economic features.

For years the composition as well as the form of rails has been the subject of conflicting opinion. In recent years rail sections have become fairly well standardized, but the quality of rail steel continues to be an increasing source of trouble. While rail weights have been increased and rail sections have been deepened to give added stiffness to meet increasing wheel loads, the increase in size and improvement in shape have produced no commensurate results in reducing rail failures. Only by the introduction of alloy steels or by the heat-treatment of the rails has it been possible to bring down the percentage of rail failures, and then only at a cost in excess of the value of the results obtained. Also, both alloy-steel rails and heat-treated carbon-steel rails present certain characteristic defects which still have to be eliminated. Thus, the solution of the rail problem has remained just beyond reach.

Of all the defects generally found in rails, transverse fissures continue to give the greatest concern. Despite all efforts to eliminate them the number of rails which fail because of this defect increases from year to year. Detector devices have successfully located great numbers of transverse fissures and other defects in rails in track and have led to the removal of many rails before breakage occurred. Similar tests applied to rails before they are shipped from the mills should further reduce the rail-defect trouble. But these methods are curative and not preventive at best.

What is needed is actual determination and elimination of the causes of transverse fissures and other serious defects, so that large rails of reliable and uniform quality may be produced. To this end the new cooperative investigation has been undertaken. It is to be hoped that the fact that it is long overdue may spur both parties into unusual effort in following out the faint leads that they now have as to the cause of internal fractures. Once that is determined, attention can be concentrated upon producing stronger rails without sacrifice of the qualities essential to the production of fissure-free rails, until now an impossible accomplishment.

Safety and Risk

IN HIS constant contact with prescribed working stresses, building codes and standard specifications, the engineer tends to acquire the subconscious belief that safety is something definite, something that can be expressed by a precise quantity. With this he tends to have an undue faith in safety factors. Unfortunately the fact is that safety cannot be marked out by a sharp boundary line; it will always remain a matter of degree. And, moreover, the particular degree of safety suitable for one set of conditions may not be the best for another. Judgment always has a prominent place.

These facts, we hold, deserve to be written prominently in every engineer's consciousness, even at the risk of weakening his respect for traditional standards. He will build better if his work is guided by a discriminating understanding of the real nature of safety. Reverence for traditional safety factors and working stresses is often in danger of going to an unsound extreme, especially in American practice. Engineers of other countries, with less of this reverence, many times are able to apply the resources of their art to better advantage.

One element that determines degree of safety is size of risk. We single it out for present mention because it is too often overlooked, and because it bears potentially on nearly every undertaking in the field of civil engineering. Admittedly a structure on which human life depends should be built more secure and dependable than one on which property alone depends. In the same light, a hazard to hundreds or thousands of lives calls for greater consideration than a hazard to only one or two. These principles are obvious enough, and they have not infrequently found application, as for example in the planning of dams. But they are not always applied. Common practice in the design of buildings—to go to a different field—applies the same methods and calculation data to the most ambitious tower structure as to one of moderate heights and proportions. The tremendously massed hazards of concentrated populations in very large cities are too rarely considered.

Sound engineering planning, we believe, will always allot its safety provisions and safety margins with full consideration for size of risk. This will not mean, in all cases, greater safety factors, for large size itself has influence on design stresses and the influence of contingencies; a small plate-girder span to carry a railroad track may properly have lower working stresses than a river span of great magnitude. But with due thought for other influences, size of risk is a consideration that may never be overlooked in design for safety.

Design Features of a 90-Ft. Circular Low-Lift Pumping Plant

Great depth of pump pit and heavy earth pressure require use of circular substructure —Annular well with overflow weirs provides for surge effects of 11-mile supply tunnel

A CIRCULAR substructure with an outside diameter of 90 ft. and a total depth of 108 ft. will house the low-lift pumping equipment at the new Springwells project of the Detroit water department. The 3-ft. concrete wall of the structure was sunk as an open caisson from the bottom of a 25-ft. excavation through 53 ft. of clay and 12 ft. of hardpan. The ground level is to be raised by a 10-ft. fill. Eight vertical motor-driven centrifugal pumps of 420-m.g.d. total capacity, supported by a floor 74 ft. below main-floor level, will pump raw water from the 12-ft. supply tunnel to the mixing chamber of the filtration plant. Between the outer wall of the structure and a 3½-ft. inner shell there is a 5-ft. annular space which serves as a suction and surge chamber and also provides space for vertical concrete discharge flumes. Access to the lower floors will be by stairways and an elevator operating in a shaft sunk outside the station wall. The superstructure is to be rectangular, integral with that of the adjoining high-lift plant.

The new filtration and pumping plants comprising the Springwells station are being constructed on a 40-acre site in Detroit's northwest section at a point which is to become the center of distribution for a rapidly growing area. The 11-mile tunnel to convey raw water from a new intake in the Detroit River to the new plant is rapidly nearing completion. The low-lift plant will pump water from this supply tunnel to the filter-plant mixing chamber, from which the flow through the various purification processes will be by gravity. Early studies had considered the advisability of locating the low-lift pumps at the river end of the tunnel but found the Springwells location preferable from the standpoints of economy and facility of operation. The location selected is directly adjoining the Springwells high-lift plant, in the northeast corner of the property.

Preliminary estimates of the quantities to be supplied by the new station indicated that the average daily demand by the new service district would be 197 m.g.d. in 1940 and 206 m.g.d. in 1950. As Detroit's past experience shows that the ratio of maximum-day to average-day demand has a limiting value of 1.35, the corresponding quantities to be supplied by the low-lift plant will be 266 and 278 m.g.d. The minimum delivery elevation of raw water at Springwells was set at 54.5. With the Detroit River stage at El. 90.0, a flow through the tunnel of 326 m.g.d. would occasion a friction loss equal to the 35.5 ft. available. This quantity can be considered the ultimate flow to be taken by the plant unless the entire hydraulic grade line should be raised by a booster pumping plant located at the river end of the intake tunnel.

Type of Equipment

Before deciding on motor-driven pumping equipment, studies were made of installation and operating costs of driving centrifugal pumps with three kinds of power: steam turbines, water turbines and electric motors. The use of steam turbines would allow close control of pump speed, would have a dependable power supply and permit the use of horizontal-shaft pumping units. On the other hand, it would necessitate the introduction of high-pressure steam lines into the deep pump pit, with all the hazards to life involved, and further would require the use of reduction gears between the turbines and the pumps to drive the pumps at reasonable speed.

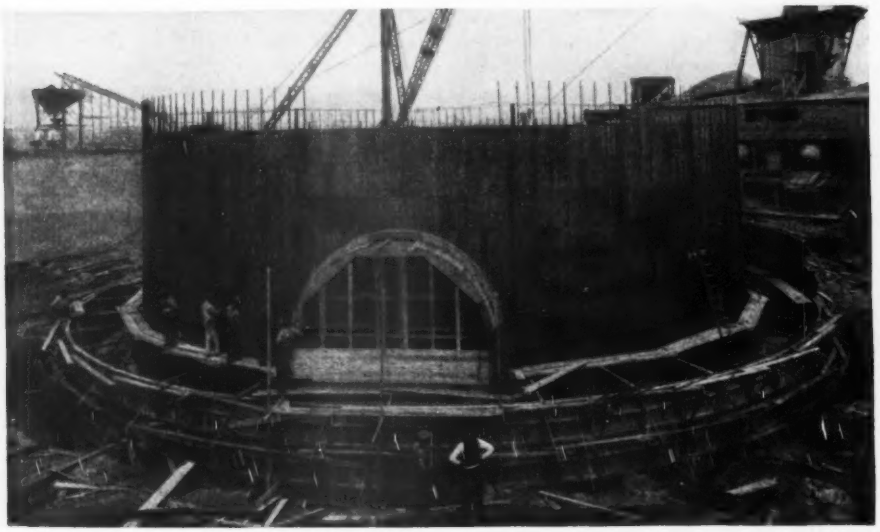

Fig. 1—Wall forms being erected prior to start of excavation

Circular formwork in center is for connection to 12-ft. supply tunnel. When caisson is sunk to grade, eye being formed will be 58 ft. below existing ground level.

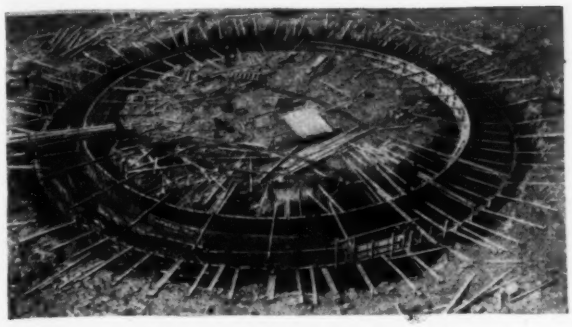

Fig. 2—Cutting shoe for caisson assembled ready to receive wall forms

The water-turbine drive contemplated pumps with vertical shafts driven by water delivered under pressure by the high-lift plant. The study of this plan showed that it would be uneconomical.

Electrical-motor drive would permit the design of a smaller station, especially as vertical-shaft units could be used to place the electrical equipment above the high water of possible flooding. Equipment to be located in the pit would be simpler than steam turbines and the high-pressure-steam hazard would be avoided. Electrical efficiency and low operating costs, however, required that the greatest possible use be made of synchronous motors, which run at constant speed. The problem of obtaining economical control of the quantity of water delivered by the station was solved by providing a few of the units with slip-ring induction motors, subject to speed control, the remaining units to be driven at constant speed by synchronous motors. The use of direct-current motors was also considered but was abandoned as being less economical.

Pumping Units

The units to be installed consist of six pumps rated at 60 m.g.d. each, driven by synchronous motors, and two 30-m.g.d. pumps driven by slip-ring induction motors having a normal speed of 500 r.p.m. In following the demand day by day the greater part of the equipment can be operated at highest efficiency at constant delivery in multiples of 60 m.g.d., and the remainder of the load taken by the variable speed units. The loss in economy by using induction motors is not so great as would be involved in throttling the discharge line to obtain the required delivery.

The heads against which the pumps will operate in the future will depend upon the amount of water being delivered to the projected Northeast station and to the existing Waterworks Park station, as well as upon the pumpage at Springwells, because of the friction losses in those sections of the supply tunnel common to two or three plants. Taking into account those anticipated flows, the average head on the pumps, assuming average river level and average-day flow, will be 53 and 54 ft. for 1940 and 1950 respectively. At the time of the initial operation of the plant the average head expected is 47 ft. At the ultimate capacity of the tunnel a head of 82 ft. will be imposed on the pumps.

The two 30-m.g.d. pumps and three of the 60-m.g.d. pumps are equipped with impellers rated at 50-ft. head. The other three 60-m.g.d. impellers have a rated head of 60 ft. It is expected that the lower-head impellers will be replaced by others rated at 60 ft. when it becomes necessary.

In addition to specifying the capacities of the units at the rated heads, the specifications under which the pumps were purchased further defined the head-capacity characteristic curves by requiring that the delivery should not be reduced more than one-third when the pumps operate against a head 20 ft. greater than that at which they are rated. By so defining the performance charac-

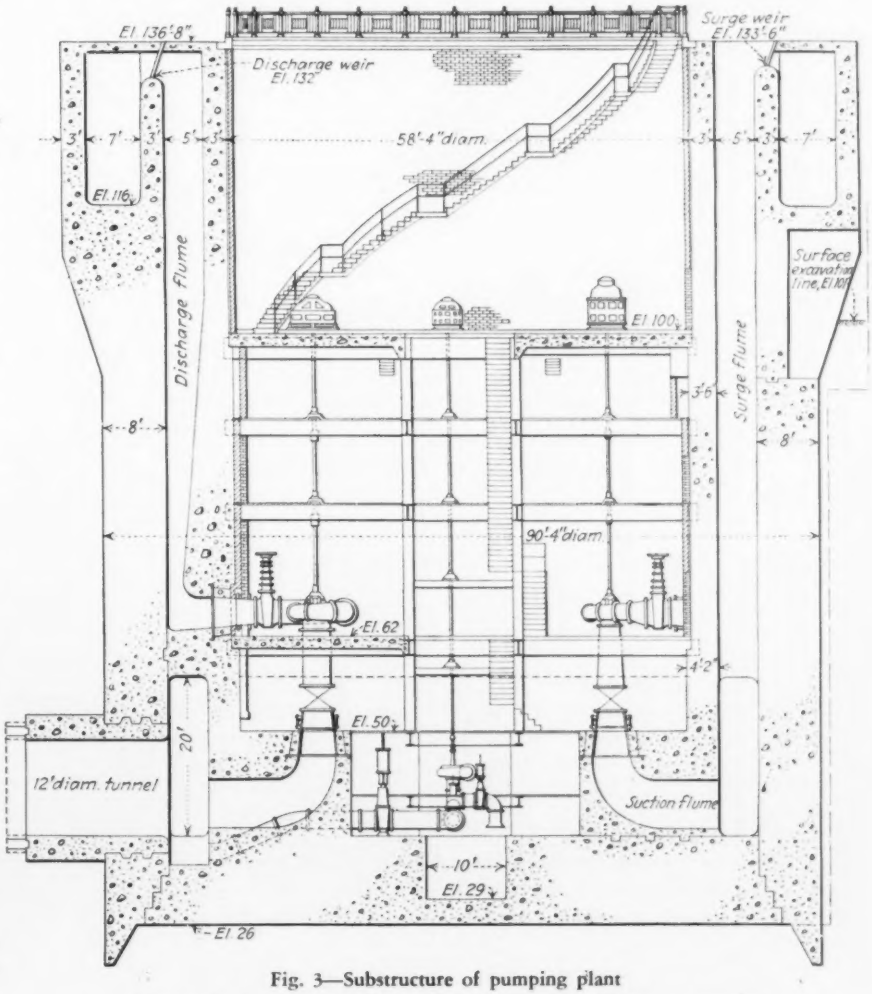

Fig. 3—Substructure of pumping plant

The tunnel at the lower left supplies the suction chamber, an annular space between caisson shell and inner circular wall. Discharge flumes and surge flumes extend up to a similar annular discharge channel above. Motor floor above river level to eliminate danger of flooding.

teristics of the units it was possible to select a combination of pump sizes which would allow the expected demand to be followed closely and at high efficiency.

For example, the head imposed on the pumps will be 66 ft. at the 1950 maximum-day flow, 278 m.g.d. At this head the delivery of the 60-m.g.d., 50-ft. head pumps will be 45 m.g.d. each, and that of the 60-m.g.d. 60-ft. head pumps will be 55 m.g.d. each. Leaving one of the higher-head pumps out of service, the total delivery of the constant-speed units will be 245 m.g.d. At the imposed head the 30-m.g.d. variable-speed motors will deliver 15.5 m.g.d. each at 470 r.p.m., one of the speeds available with the slip-ring motors. The total capacity of the equipment will therefore be 276 m.g.d., approximating closely the 278-m.g.d. demand.

The elevation of the hydraulic grade line at the Springwells end of the supply tunnel will vary from 95 at minimum-day flow at the beginning of operation to its lowest possible value of 54.5 sometime in the future, depending on the tunnel flow to each of the water-works stations. Under average flow conditions water in the suction chamber will stand at El. 82.4 and 81.6 in 1940 and 1950 respectively, and maximum-day suction-chamber elevations corresponding to those years will be 66.0 and 64.0. Even when the station is operating at its ultimate maximum-day capacity, suction-chamber level will not drop below El. 59.0.

Fig. 5—Cutting shoe comes to rest in hardpan

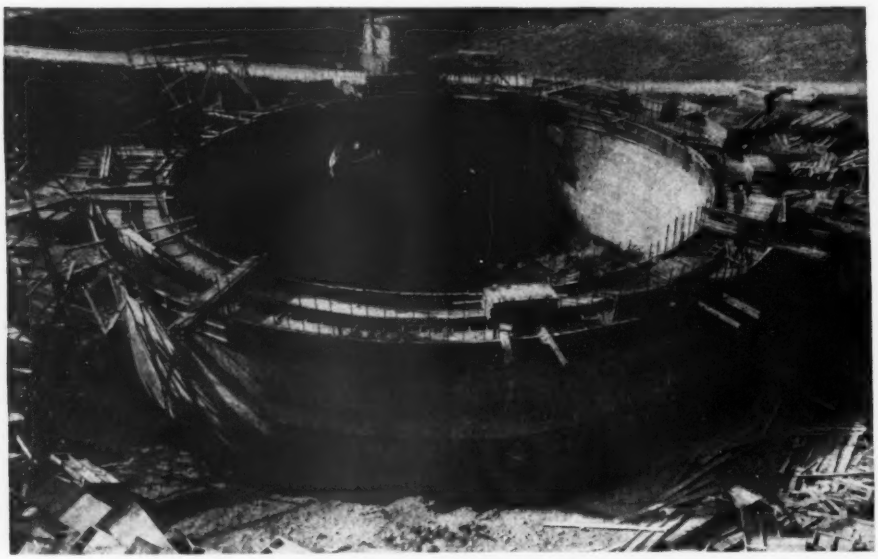

Fig. 4—Sinking of caisson partly completed

Excavation in right background for high-lift plant to be built adjoining.

With center line of pump casings at El. 65.0, the pumps will be operating under a positive suction head most of the time and will not need priming. The greatest static suction lift will be is 9.5 ft.

Circular Shape to Withstand Soil Pressures

Past experiences in building sewer and railroad tunnels in the blue clay underlying Detroit had indicated that the active earth pressure exerted by the material had a range of possible values of from 62.5 to 130 lb. per sq.ft. per foot of depth. In designing the Springwells tunnel, it had been assumed that the angle of repose of the material was between 4½ and 6½ deg., and that the clay weighed 110 lb. per cubic foot. The lateral pressure computed from these conditions has a value of 76 lb. per sq.ft. per foot of depth. Due to the importance of the structure and the uncertainties as to the soil behavior, the low-lift plant was designed to resist earth pressure due to an intensity of 80 lb. per sq.ft. per foot of depth, with unit stresses of 16,000 lb. per sq.in. in steel reinforcing and 650 lb. in concrete.

With soil pressures of such magnitude to withstand, a circular substructure was clearly dictated; for with a rectangular form, wall thicknesses would become unreasonably great unless the wall span were divided into short segments by means of interior intermediate bracing, which would interfere with satisfactory operation. Due to the structural advantages of an arch, a circular shape would allow reasonable wall thicknesses to resist the expected earth pressures. The accompanying Tables I and II show the beam depths and shell thicknesses of rectangular and circular structures, respectively, under given conditions of depth below ground, span and diameter. It was understood that the condition of uniform loading assumed in the simple arch formula, $T = pr$, would probably not be encountered, so that somewhat greater wall thickness would be required for the circular station than the table indicates.

Construction Methods

Construction of the station by the caisson method was selected in preference to two other methods studied, open cut with complete sheeting of the interior and segment construction of the outer wall in sheeted wells. The use of the sheeted open cut would involve a great amount of interior bracing, which would interfere with the free removal of the interior core. In the segment method of construction short sections of wall would be excavated and sheeted to the bottom and the space filled with concrete. The number of vertical joints made necessary by this method was considered objectionable. Further, the inside surface of the station wall would be rough and require finishing, unless forms were used. The caisson method of construction was free from these objec-

tions and was estimated to cost less than other methods.

The main wall of the substructure, 8 ft. thick and 90 ft. 4 in. outside diameter, was sunk as an open caisson to a depth of 65 ft. below the bottom of a 25-ft. open-cut excavation. The first 53 ft. was through the blue clay characteristic of the Detroit subsoil, and the remainder through hardpan. The wall was poured to a height 43 ft. above the bottom of the excavation to meet the designed hydraulic conditions of the filtration plant.

Suction and Discharge Arrangements

After the caisson sinking had been completed the foundation slab, 11 ft. thick, was poured. Above the slab an inner circular shell, 3 ft. thick and 58 ft. 4 in. inside diameter, forms the wall of the pump pit proper, and leaves an annular space 5 ft. wide between the outer and inner walls. This space is connected with the 12-ft. supply tunnel conveying raw water from the Detroit River and serves as a suction and surge well for the pumps. Each of the eight bottom-suction pumps is connected to the chamber by 13 ft. of cast-iron suction piping and a curved concrete suction flume. A hydraulic valve in each suction and discharge line makes possible the isolation of any unit. To allow repairs to be made to the valves, roller-type sluice gates are installed at the entrance to the suction flumes. The gates are to be operated by the electric traveling crane in the plant.

Pump discharge pipes pass radially through the pump-pit wall and connect with concrete discharge flumes, which occupy somewhat less than half the total space available in the annular chamber. These flumes are shaped so as to gradually reduce the water's velocity while changing its direction from horizontal to vertical. At the top of the flumes the water spills over weirs with crests at El. 132 into the conduit leading to the filter plant. Walls 3 ft. thick form the sides of the discharge flumes and separate it from the adjoining flumes.

TABLE I—THICKNESS OF WALL FOR RECTANGULAR STRUCTURE

Span, Ft.	Depth Below Ground Surface: 20 Ft.	40 Ft.	60 Ft.	80 Ft.
16	24	32	38	43
20	29	39	46	54
25	35	48	57	65
50	65	92	113	128

TABLE II—THICKNESS OF WALL FOR CIRCULAR STRUCTURE

Outside Diam., Ft.	Depth Below Ground Surface: 20 Ft.	40 Ft.	60 Ft.	80 Ft.
60	6	12	19	25
80	8	16	25	33
100	10	20	31	41
120	12	25	37	49
140	14	29	43	57

TABLE III—ELEVATION OF MAXIMUM SURGE CAUSED BY COMPLETE SHUTDOWN

Diam. of Surge Chamber, Ft.	Rate of Pumpage Preceding Shutdown: 266 m.g.d.	278 m.g.d.	341 m.g.d.	457 m.g.d.
20	184.0	186.0	204.0	242.0
25	164.0	164.5	177.5	209.5
30	149.5	150.5	160.5	188.0
35	141.0	140.5	148.5	173.5
40	134.0	133.0	139.5	162.5
45	128.0	127.0	133.0	154.0
50	124.0	123.0	127.5	148.0

The space between the discharge flumes is available for surge action. Should the surge occasioned by the sudden stopping of pumps attain sufficient magnitude, the water will rise in the surge space until it overflows weirs at El. 133.5. The water so spilled will be directed to the raw-water conduit and conveyed to the filter plant. The 1½-ft. difference in elevation in the surge and discharge weirs prevents minor backwater in the conduit re-entering the suction chamber.

Provision for Surge Action

The great amount of kinetic energy possessed by the water in the 11-mile tunnel, when moving at a velocity of 4 to 6 ft. per second, will occasion surges of considerable magnitude whenever the rate of pumpage is altered. The maximum surge possible is that due to a sudden complete shutdown following capacity operation. Initial studies were based on a station design incorporating a circular vertical shaft or well in which the water could rise until the potential energy built up, aided by the frictional resistance of the tunnel walls, would balance the original kinetic energy. Computations based on a pumping rate of 326 m.g.d. and sudden complete shutdown showed that a surge chamber 50 ft. in diameter would be required if the maximum rise was to be kept below the elevation of finished grade. The elevations attained by the water in the chamber at the top of its first surge for various assumptions of diameter and rate of pumpage are shown in Table III. Elevation of finished floor at the station is to be 136.67. The values are based on high-river level and conservative friction losses, and the effect of other smaller shafts along the line of the tunnel in venting the surge is neglected in making the computations upon which the table is based.

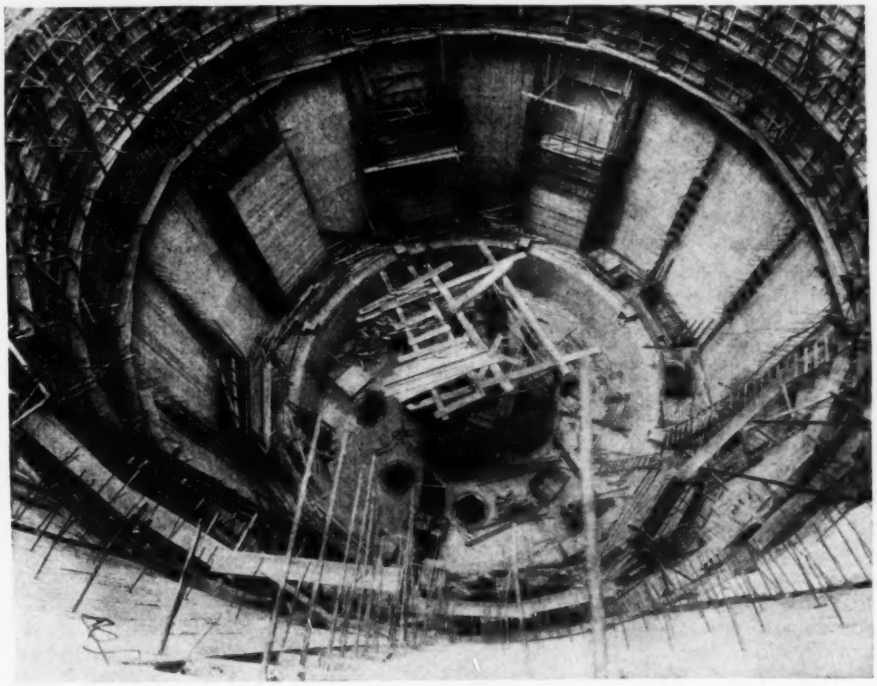

Fig. 6—Interior of plant during construction

Openings in suction floor show upturned ends of suction flumes. Forms are being set around the walls of the pump pit are for the surge and discharge flumes.

The plan of providing the chamber with an overflow weir, so that all surges in excess of a predetermined value could be discharged, was investigated and found to be advantageous in regard to both cost and safety. Surge experiments on a scale model of the tunnel system indicated that serious conditions could be caused by a condition of resonance, induced by cutting individual pumps out of service during the upward swings of minor surges. Further, the final magnitude of the surge was rendered indeterminate by the effect of the unknown draft on the branch tunnel to be built in the future to

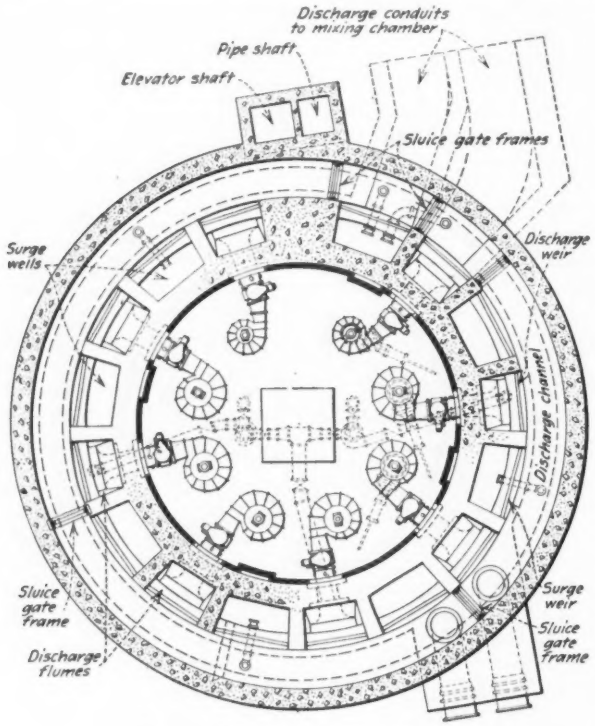

Fig. 7—Plan view of pumping plant

supply the proposed station in the northeast section of the city. A spiling surge well was found to eliminate these dangers and to work no hardship on the operation of the mixing basin.

Design of Interior

A 10-ft. diameter sump, 9 ft. deep, in the center of the floor collects the drainage from the station equipment. Mounted directly above it are two 7.2-m.g.d. pumps capable of unwatering the station quickly in case of a break in a major conduit or pipe line. Connections from these pumps to the annular suction chamber permit the unwatering of the tunnel in case of necessity. The pumps are capable of two speeds, one to be used for a 55-ft. head and the other for a 110-ft. head. At the low speed they can be used for everyday operation to assist the main pumping units. Ordinary drainage is handled by two 300-g.p.m. horizontal pumps, motor driven.

The pump floor, at El. 62, is of reinforced concrete, supported by steel beams and columns. The motors are set on a floor at El. 100. To provide steady bearings for the long vertical shafts, there are two intermediate skeleton floors with steel gratings forming the floor surface.

Access to the motor floor, 37 ft. below the main floor, is provided by a circular stairway built around the pump-pit wall. Steel stairways from the motor floor to the lower floors are supported by the steel framework of the interior. For more convenient access, however, an elevator shaft outside the building has short tunnels through the wall communicating with the motor and pump floors. The shaft was constructed outside because of the lack of space available within the station walls.

A single superstructure is to cover both the low-lift plant and the adjoining high-lift plant. Accordingly, this superstructure is rectangular in plan and does not betray to the spectator that one of the pumping plants has a circular substructure. The single superstructure facilitates supervision of all pumping machinery.

The plant was designed by the division of engineering of the Detroit water department, under the general direction of George H. Fenkell, general manager and chief engineer, and Frank H. Stephenson, assistant chief engineer. William C. Rudd, assistant engineer, was directly in charge of the design of both low-lift and high-lift pumping stations and the generator and boiler plants to be built in conjunction with them, assisted by Frank E. Simpson and Bernard J. Mullen. The low-lift plant was constructed by the E. H. Latham Co., of Columbus, O., under the supervision of L. G. Lenhardt, assistant engineer for the water department.

Malaria-Control Survey in Texas

A malaria survey in 40 counties in eastern Texas was made in November and December, 1930, by representatives of the Texas department of health and the U. S. Public Health Service. The basic work was confined to rural schools, chosen as representative of the various districts. Some 360 schools were visited and 20,000 blood smears taken from among 32,000 children. In the larger schools the smears were taken from those children only who voluntarily gave a history of malaria within the past year or two. All the smears were sent to the National Institute of Health, Washington, D. C., to be stained. Examinations are divided between the institute and the state health laboratory at Austin. During the survey observations were made on mosquito propagation, screening, mosquito-proofing of farmhouses and treatment of those suffering from malaria. Preliminary conclusions from the survey are:

1. That malaria infection and the malaria-bearing mosquito are still a heavy incidence.

2. That there is more need for malaria control in Texas now than there was in the Panama Canal Zone twenty years ago.

3. A very negligible per cent of malaria-infected persons was under the care of a physician or was attempting the standard treatment.

4. While the mosquito-breeding elimination problem is so extensive and requires funds not now available, a program of mosquito-proofing of rural homes and tenant houses is accepted as the major constructive immediate activity for reducing the malaria incidence.

Among those engaged in the survey were Dr. L. L. Williams and Senior Sanitary Engineer J. A. LePrince, U. S. Public Health Service; Dr. J. C. Anderson, Chief Engineer V. M. Ehlers and Assistant Engineer E. G. Eggert, of the Texas department of health.

Streamflow Differences in 1930 Drought

By ROBERT FOLLANSBEE
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COMPARISON of streamflow in the water year 1930 with that for 1929 in the adjacent plains states of South Dakota and Nebraska shows in a striking manner the lack of general relationship between precipitation and runoff. Table II shows the comparison in runoff between the two years.

In view of the widespread drought during 1930, an inspection of this table would indicate that the precipitation was deficient throughout the greater part of South Dakota but was nearly normal in Nebraska (assuming that 1929 was a normal year, which is borne out by the precipitation records). However, a comparison between the precipitation for the water years 1929 and 1930 shows such was not the case.

Table I shows the percentage of 1930 discharge to that for 1929, and the mean precipitation in each basin for both years. The most casual inspection of this table shows the utter lack of a general relationship between precipitation and discharge. At one extreme of the South Dakota streams is the discharge of the Grand and Moreau rivers. The 1930 discharge was about 40 per cent of that for 1929 and yet the precipitation was 2.54 in. greater, or 118 per cent. In the Cheyenne basin the discharge was about 36 per cent of that for 1929 and yet the precipitation was 102 per cent. At the other extreme is the discharge of the Big Sioux basin, which was about 62 per cent of that for 1929, with a precipitation of 76 per cent.

In Nebraska both the discharge and precipitation for the two years were nearly equal, although in the Loup River basin the discharge was very nearly the same as that for 1929 with the precipitation 16 per cent greater.

Many years ago Henry Gannett made a study of the relationship between precipitation and discharge in the United States (unpublished report on precipitation and runoff, U. S. Geological Survey) and came to the conclusion that where the former is less than 20 in. there is no relationship between the two, the discharge depending very largely upon the intensity of precipitation. In addition, the stage of the groundwater is an important factor. It should be noted that the region of greatest differences in the precipitation-discharge relationship is South Dakota, where the precipitation was practically all less than 20 in. In Nebraska the precipitation was greater than 20 in. and the relationship was more consistent.

These streams are measured by the U. S. Geological Survey in cooperation with the army engineers.

TABLE I—PERCENTAGE OF 1930 DISCHARGE TO THAT OF 1929 AND PRECIPITATION COMPARISON

Gaging Station	Percentage of 1930 Discharge to 1929	Precipitation in Inches 1930	1929
South Dakota			
Missouri River near Mobridge	75	(a)	(a)
Missouri River at Pierre	71		
Missouri River at Sioux City	75	...	...
Grand River near Wakpala	45	16.40	13.86
Moreau River at Promise	35		
Cheyenne River at Edgemont	23		
Cheyenne River near Wasta	51	16.32	16.05
Cheyenne River near Carlin	35		
Rapid Creek near Pactola	53		
Rapid Creek at Creston	46	15.71	22.63
Belle Fourche River near Elm Springs	33		
Bad River near Fort Pierre	129	17.44	15.65
White River near Interior	89	21.16	20.02
White River near Oacoma	112		
James River at Huron	38	19.91	21.40
James River near Scotland	35		
Big Sioux River near Flandreau	69	19.06	25.23
Big Sioux River at Akron	54		
Nebraska			
Missouri River at Omaha	72	(a)	(a)
Niobrara River near Gordon	99	20.48	23.96
Niobrara River near Valentine	108		
Middle Loup River at St. Paul	111		
North Loup River near St. Paul	100	26.18	22.45
Loup River near Genoa	100		
Platte River near Duncan	86	24.47	22.97
Platte River near Ashland	97		
Elkhorn River at Waterloo	94	23.61	28.60
Republican River at Max	97	25.11	20.12
Frenchman Creek near Hamlet	97		

a Not given, as river drains a large area above South Dakota.

TABLE II—DIFFERENCE IN 1930 DROUGHT EFFECT ON STREAMFLOW IN SOUTH DAKOTA AND NEBRASKA

Gaging Stations	Drainage Area, Sq.Mi.	1930 Discharge in Acre-Ft. Total	Per Sq.Mi.	1929 Discharge in Acre-Ft. Total	Per Sq.Mi.	Percentage 1930 to 1929
South Dakota Streams:						
Missouri River near Mobridge	209,000	15,200,000	73	20,200,000	97	75
Missouri River at Pierre	242,000	16,100,000	67	22,500,000 (a)	...	71
Missouri River at Sioux City	314,000	18,800,000	60	25,200,000	80	75
Grand River near Wakpala	5,640	108,000	19	242,000	43	45
Moreau River at Promise	5,220	101,000	19	285,000	55	35
Cheyenne River at Edgemont	6,050	102,000	17	236,000	39	23
Cheyenne River near Wasta	11,700	345,000	30	678,000	58	51
Cheyenne River near Carlin	23,400	689,000	30	1,970,000	84	35
Beaver Creek near Burdock	1,480	50,000	34	(b)	...	...
Rapid Creek near Pactola	319	48,800	153	92,500	290	53
Rapid Creek near Creston	710	66,300	93	143,000	202	46
Belle Fourche River near Elm Springs	7,130	270,000	38	892,000	125	33
Bad River near Fort Pierre	3,170	134,000	42	104,000	34	129
White River near Interior	4,120	158,000	38	177,000	43	89
White River near Oacoma	10,100	454,000	45	406,000	40	112
Little White River near White River	1,390	92,900	67	(b)	...	...
James River at Huron	11,500	82,300	7	218,000	19	38
James River near Scotland	15,800	116,000	7	330,000	21	35
Big Sioux River near Flandreau	2,520	79,600	32	115,000	46	69
Big Sioux River at Akron	7,080	312,000	44	574,000	81	54
Nebraska Streams:						
Missouri River at Omaha	323,000	19,000,000	59	26,500,000	82	72
Niobrara river near Gordon	3,050	126,000	41	127,000	42	99
Niobrara River near Valentine	6,160	669,000	109	622,000	100	108
Niobrara River near Spencer	10,800	1,010,000	94	(c)	...	...
Middle Loup River at St. Paul	7,320	991,000	136	896,000	123	111
North Loup River near St. Paul	4,040	725,000	179	726,000	180	100
Loup River near Genoa	13,400	1,980,000	148	1,990,000	148	100
Platte River near Duncan	61,600	2,120,000	34	2,460,000	40	86
Platte River near Ashland	83,800	4,990,000	60	5,160,000	62	97
Elkhorn River at Waterloo	6,390	691,000	108	735,000	115	94
Republican River at Max	6,220	110,000	18	114,000	18	97
Republican River near Bloomington	19,000	517,000	27	(b)	...	...
Frenchman Creek near Hamlet	1,420	63,800	45	65,900	46	97
Little Blue River at Endicott	2,590	221,000	85	(b)	...	...

(a) Chamberlain record. (b) Incomplete record. (c) Record not available at present.

Influence of Seeding Material on Sludge Digestion

Laboratory experiments at Baltimore indicate well-digested sewage sludge of proper age not necessary for seeding purposes to obtain digestion when incubation temperatures are maintained close to 28 deg. C.

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WHAT HAS BEEN CONSIDERED a requisite for rapid sewage-sludge digestion was the presence of large quantities of well-digested material in relation to the volume of raw sludge to be decomposed. Experience in a large number of localities, having widely varying climatic conditions and handling sludges with markedly different characteristics, has proved the truth of this statement. These observations, however, have been made at field temperatures rarely if ever above 70 deg. F. Since the optimum temperature for sludge digestion has been found by Rudolfs to be about 28 deg. C. (80 to 85 deg. F.), it was considered desirable to study in the laboratory the effect of various types of seeding material upon raw sludge at this temperature. The sludges used were from about eight days to eight years old and contained from 48.3 to 75.8 per cent volatile matter. Since Baltimore sludge with 55 per cent volatile solids is regarded as digested, some of the materials were thoroughly decomposed while others were decidedly undigested. To these sludges, which were kept in separate containers at a *pH* varying from 7 to 7.2, a definite quantity of raw solids was added daily, and an equivalent quantity of decomposed material was removed weekly. At the end of about 60 or 70 days all of the sludges except the one which was decidedly raw (75.8 per cent volatile matter) had essentially the same physical and chemical characteristics. It would seem, therefore, that in the practical operation of digestion tanks, which are to be kept at a temperature of about 28 deg. C., partly digested as well as digested sludge can be used for seeding purposes, provided the *pH* of the sludge is kept at about 7.

Original sludge sample contained 250 grams of dry solids and had 75.8 per cent of volatile matter. In computing cubic feet of gas per capita per day it was assumed that 40 grams of dry solid matter were digested per capita per day.

Studies Using Seeding Sludge Containing From 48.3 to 71.7 Per Cent Volatile Matter

The experimental work, which relates to the general problem of the influence of seeding material on the digestion of raw sludge, was conducted at two different times. The studies are, therefore, presented in two parts, the first covering digestion studies when the seeding sludges contained from 48.3 to 71.7 per cent volatile matter, and the second with sludge having 75.8 volatile matter—a decidedly raw material. Both the raw and digested sludges used during the entire experiment were collected at the Baltimore sewage-works. The sewage treated at this plant is domestic in character and is from a separate system of sewers. The sludge is obtained from preliminary sedimentation tanks, which are cleaned about once a week. This material is then stored in separate sludge-digestion tanks, where it is permitted to decompose.

Sufficient quantities of sludge, the characteristics of which are given in Table I, were collected from six of the digestion tanks. As is indicated, the materials were in all stages of decomposition. Some of the sludges were just beginning to digest, while others were several years old and were very well decomposed.

Each portion of sludge was thoroughly mixed and then separated into two parts. Each part was put into a 5-gal. glass bottle, the quantity being adjusted so that there were 250 grams of dry solids present. The bottles were segregated into two groups with six bottles in each group. The *pH* of the material in all of the bottles was then adjusted to 7-7.2 with hydrated lime. As shown in Table II, the quantity of lime used varied from a minimum of 5 to a maximum of 30 grams. The bottles were than incubated at 38 deg. C.±1 deg. (about 82 deg. F.).

Daily additions of raw sludge (dry solids basis), amounting to 2 and 6 per cent by weight of the dry solids

TABLE I—CHARACTERISTICS OF SLUDGE USED FOR SEEDING

Volatile Matter, Per Cent	Ether Soluble Matter, Per Cent	Moisture, Per Cent	*pH*	Approx. Age, Years	Odor	Color	Remarks
48.3	8.6	91.7	7.0	8†	Tarry	Very black	Very well digested
50.7	10.6	90.5	7.0	3	Tarry	Black	Well digested
57.9	9.6	91.7	6.9	2	Tarry	Black	Digestion near completion
63.4	11.7	94.3	6.8	1.5	Tarry	Very black	Partly digested
67.4*	15.6	94.8	6.7	0.2	Fecal	Very dark brown	Digestion just beginning
71.7*	19.6	89.3	6.4	0.1	Fecal	Brown	Digestion just beginning
75.8	36.0	82.9	4.9	8-10d'ys	Fecal	Grayish yellow	Raw material

*Sludge was gasing vigorously at beginning of experiment.
†Sludge was obtained from old experimental digestion tanks.

TABLE II—GRAMS OF HYDRATED LIME USED TO KEEP THE *pH* OF THE SLUDGES BETWEEN 7 AND 7.2
(Duration of Experiment, 98 Days)

Volatile Matter In Original Sludge	March 14*	March 22	March 30	April 6	Total
Group I—2 Per Cent Additions of Sludge					
48.3	5	5	..	..	10
50.7	5	5	..	..	10
57.9	10	5	..	..	15
63.4	15	5	..	..	20
67.4	20	0	..	..	20
71.7	30	15	10	10	65
Group II—6 Per Cent Additions of Sludge					
48.3	5	10	..	..	15
50.7	5	15	..	..	20
57.9	10	5	..	..	15
63.4	15	15	..	..	30
67.4	20	0	..	..	20
71.7	30	20	20	20	90

*Beginning of experiment.

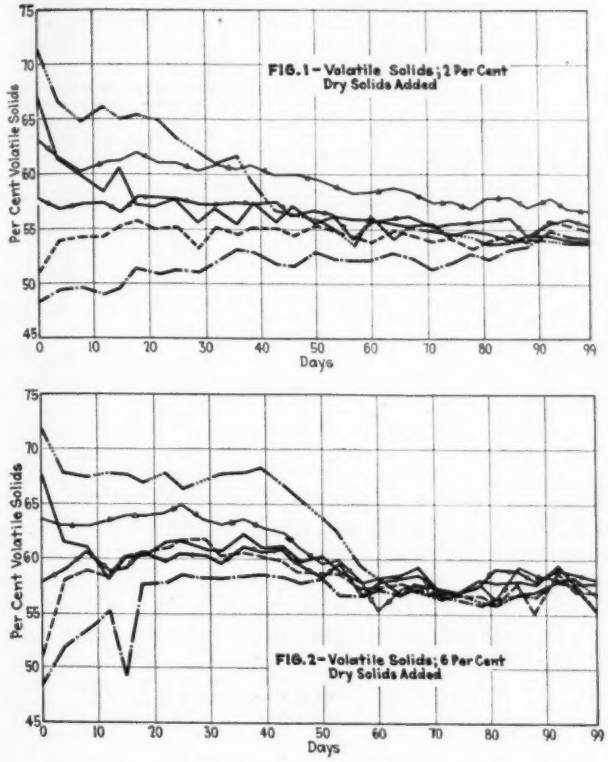


FIG. 1 – Volatile Solids; 2 Per Cent Dry Solids Added
Per Cent Volatile Solids
Days
FIG. 2 – Volatile Solids; 6 Per Cent Dry Solids Added
Per Cent Volatile Solids
Days

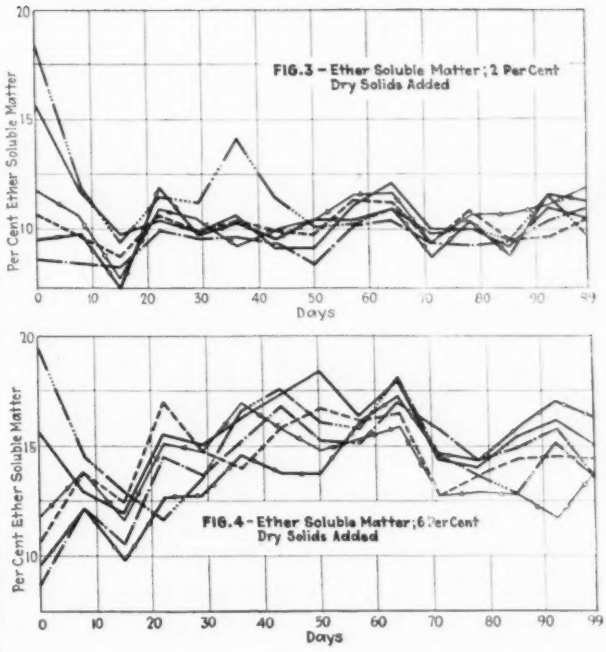


FIG. 3 – Ether Soluble Matter; 2 Per Cent Dry Solids Added
Per Cent Ether Soluble Matter
Days
FIG. 4 – Ether Soluble Matter; 6 Per Cent Dry Solids Added
Per Cent Ether Soluble Matter
Days

Figs. 1 to 4—Changes in sludges to which daily additions of sludge were made

in the sludge in the bottles, were made to the first and the second groups of bottles, respectively. The bottles receiving 2 per cent additions have been designated group I, and those receiving 6 per cent group II. The raw material was obtained near the effluent ends of the settling tanks and was from ten days to two weeks old. The volatile matter varied from 75.2 to 82.7 per cent; the ether soluble matter from 36.1 to 50.1 per cent; and the moisture from 85.5 to 92.8 per cent. The *pH* was quite low, ranging from 4.8 to 5.

Once a week enough sludge was withdrawn to leave 250 grams of dry solids in each bottle. Twice a week analyses were made to determine the *pH*, water, grease, and volatile solids of the sludge. The gas evolved was measured daily and analyzed once a week. All gas volumes have been corrected to 0 deg. C. and 760 mm. atmospheric pressure. Throughout the experiment the sludges were kept with a *pH* between 7 and 7.2. The amount of lime used (Table II) was small in spite of the fact that the sludge added daily had a low reaction.

Results—One question of particular interest related to the change in the quantity of volatile solids in the original sludge. The results both for the 2 per cent (group I) and the 6 per cent (group II) additions are given in Figs. 1 and 2 respectively. With regard to group I sludges, the amount of volatile solids in the different materials began to approach a common value shortly after the work was started. The sludges of special interest are those which originally contained more than 60 per cent volatile material. The volatile solids began to decrease in amount in spite of the fact that the raw sludge added contained an average of 78 per cent volatile material. Furthermore, the sludge in these bottles at the beginning of the experiment was not regarded as satisfactory for seeding purposes. At the end of 60 days the volatile solids in four of the bottles were very close to 55 per cent, and the materials in the other two bottles were about the same. At the end of the experiment the sludges had changed further so that the volatile matter in all the bottles was within about 1 per cent of the average, which was 54.7 per cent. All of the sludges were practically alike in that they had the same general appearance and physical characteristics at the end of the 99-day period.

The changes in the amount of volatile material in group II sludges were essentially the same as in the case of group I except that the average volatile-solid content in all of the bottles at the end of the work was 56.5 per cent, which was only 1.8 per cent higher than the volatile material in group I sludges. Here again the per cent volatile matter in the different bottles was practically the same. The average moisture of the sludges in both groups of bottles was 92.1 per cent at the beginning of the experiment. Since the moisture in the material added was 91.1 per cent and there was an average of 94.8 per cent moisture in the sludges at the end of the experiment, it is apparent that considerable liquefaction was occurring.

The reduction in ether soluble matter is presented in Figs. 3 and 4. In the case of the sludges in group I the ether soluble material showed a marked change, being about 10 per cent at the end of twenty days in all the bottles, and remaining in that condition until the end of the experiment. The other soluble materials in the bottles included in group II were higher, averaging about 15 per cent. Since there is a greater difference in the ether soluble matter in these two groups of bottles than in the total volatile solids, it is evident that some of the greases digest slowly.

Table III gives data regarding the quantities of volatile material which have been entirely destroyed or converted into gases and liquids, together with the amounts of gas produced. Generally speaking, the quantity of volatile matter which disappeared was greater in those bottles of group I which contained higher percentages of volatile material at the beginning of the experiment.

TABLE III —QUANTITIES OF VOLATILE MATTER DIGESTED AND GAS PRODUCED FROM SLUDGE CONTAINING 250 GRAMS OF DRY SOLIDS TO WHICH DAILY ADDITIONS OF RAW SLUDGE WERE MADE

Volatile Matter in Original Sludge, Per Cent	Volatile Matter Which Was Lost or Disappeared, Grams	Gas Production — Volume — CH_4 C.C.	CO_2 C.C.	N_2 C.C.	Total — C.C.	Grams	CH_4 Per Gram of Volatile Matter Lost, C.C.	Gas Per Gram of Volatile Matter Lost, C.C.	Ratio of Weight of Gas Produced to Weight of Volatile Matter Lost
Part A—Digestion Period, 99 Days.									
Group I—Daily sludge additions contained 5 grams of dry solids, or 2 per cent of dry contents of original sludge.									
48.3	244.6	191,330	83,640	31,410	306,380	340.21	782.2	1,252.5	1.39
50.7	217.1	181,630	80,170	38,910	300,710	335.84	836.6	1,385.1	1.55
57.9	235.1	191,850	84,640	39,930	316,420	353.22	815.9	1,345.7	1.50
63.4	233.1	183,410	82,700	37,600	303,710	340.46	787.0	1,320.2	1.46
67.4	306.9	224,740	99,310	27,490	351,540	389.96	732.4	1,145.6	1.27
71.7	269.6	199,720	84,180	69,650	353,550	395.07	740.6	1,311.1	1.47
Average							782.5	1,293.4	1.44
Part A—Digestion period, 99 days.									
Group II—Daily sludge additions contained 15 grams of dry solids, or 6 per cent of the dry solids in original sludge.									
48.3	667.1	528,880	239,190	59,590	827,660	922.11	792.7	1,240.6	1.38
50.7	618.9	480,950	208,850	44,030	733,830	808.82	777.1	1,185.8	1.31
57.9	666.2	556,710	244,500	51,590	852,800	942.40	835.6	1,280.1	1.41
63.4	644.5	524,560	232,020	54,560	813,140	902.56	814.0	1,261.8	1.40
67.4	706.8	525,220	222,750	18,550	766,520	835.88	743.1	1,084.5	1.18
71.7	571.6	345,510	187,470	145,030	678,010	796.31	604.5	1,186.3	1.39
Average							761.2	1,206.5	1.35
Part B—Digestion period, 187 days.									
Groups I and II—Daily sludge additions contained 5 and 15 grams of dry solids, or 2 and 6 per cent of dry solids in original sludge.									
75.8 (I)	343.3	270,835	113,622	20,820	405,277	443.37	788.9	1,180.5	1.29
75.8 (II)	630.8	341,150	163,563	30,303	535,016	603.76	540.8	848.1	0.96

This result naturally followed, since the amount of volatile solids in the six bottles at the end of the investigation was about the same. The greater increased loss in solids was accompanied by a greater production in gas. Each gram of volatile material destroyed or lost yielded an average of 782.5 c.c. of methane and 1,293.4 c.c. of total gas in the case of group I bottles, and 761.2 c.c. of methane and 1,206.5 c.c. of total gas in the case of the group II bottles. The relationship between the total weight of gas produced and the weight of volatile matter lost is given in the last column. It is of interest to note that the gas evolved weighed about 40 per cent more than the volatile solids, which were lost. This difference may be explained in a number of ways, such as the gasification of inorganic compounds or perhaps a faulty technique in determining volatile solids.

The daily quantities of total gas and methane evolved from the fresh volatile solids added daily to the bottles are shown in Figs. 5 to 8. As was to be expected, the quantities were slightly higher from the 2 per cent than from the 6 per cent additions. In every instance the original seeding sludge, which contained 67.4 per cent volatile matter, was the first to produce large quantities of gas. In the case of the 2 per cent additions a daily

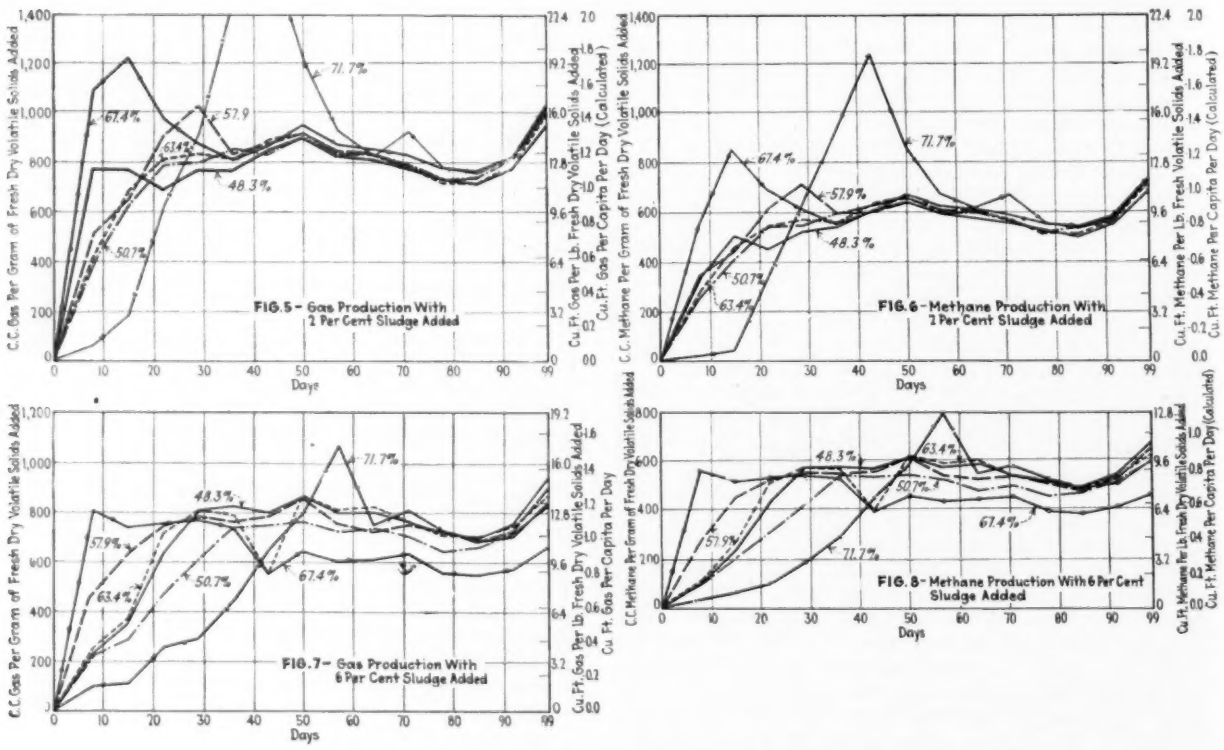


FIG. 5 - Gas Production With 2 Per Cent Sludge Added
FIG. 6 - Methane Production With 2 Per Cent Sludge Added
FIG. 7 - Gas Production With 6 Per Cent Sludge Added
FIG. 8 - Methane Production With 6 Per Cent Sludge Added
Days
71.7%
67.4%
57.9
63.4%
48.3%
50.7%

Figs. 5 to 8—Daily gas and methane production per gram of fresh dry volatile solids added

Cubic feet of gas per capita per day based on assumption that 40 grams of dry volatile solids were digested per capita per day.

TABLE IV—QUANTITY OF VOLATILE SOLIDS AT BEGINNING AND END OF EXPERIMENT

(There were 250 grams of dry solids in each of the bottles at the beginning and the end of the work.)

Volatile Solids in Original Sludge		—Volatile Solids in Final Sludge— To Which 2 Per Cent Daily Additions Were Made,	To Which 6 Per Cent Daily Additions Were Made,	Duration of Experiment,
Per Cent	Weight, Grams	Grams	Grams	Days
48.3	123.7	135.1	138.3	99
50.7	126.8	137.1	142.3	99
57.9	144.8	138.1	142.0	99
63.4	158.6	141.4	138.3	99
67.4	168.5	134.4	144.5	99
71.7	179.3	134.3	141.5	99
75.8	189.6	140.5	166.0	187

maximum of 1,207 c.c. of total gas per gram of fresh volatile solids added was reached on the fifteenth day. After that the volume decreased and remained something above 800 c.c. per day. The apparent reason for this high early peak was that gas was being given off not only from the daily additions of raw solids but also from the partly decomposed materials present at the beginning of the experiment in the original material. As was to be expected, the sludge which was the least digested and which contained 71.7 per cent volatile matter, was the last to begin active gas production. By the 43d day, however, a maximum of 1,703 c.c. of total gas per day per gram of fresh volatile solids was evolved. After the 60th day the quantities of total gas and methane from the six sludges in group I were almost the same.

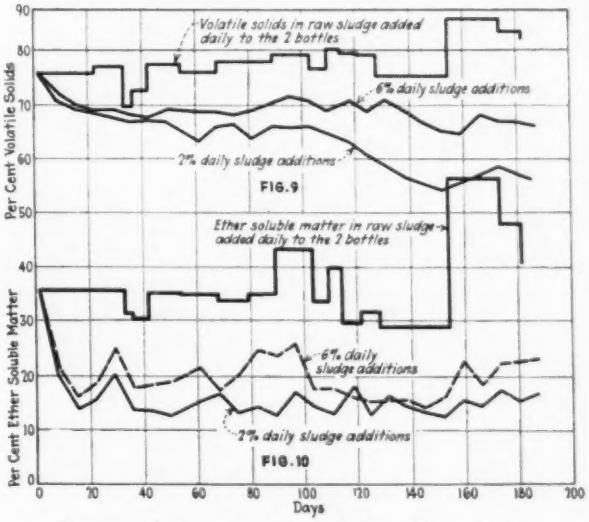
With reference to the group II sludges, gas production was somewhat slower in starting. Furthermore, the quantities of gas produced from each bottle was more varied than from the group I bottles. The calculated quantity of total gas produced per capita was very high, exceeding 1.1 cu.ft. per capita per day in the case of group I materials and averaging about 1 cu.ft. in the case of group II sludges.

Studies Using Seeding Sludge Containing 75.8 Per Cent Volatile Matter

Although six different sludges having widely varying ages and chemical characteristics were used in the preceding studies, unfortunately no work was done to see if raw sludge would digest if kept at a temperature of 28 deg. C. with a *pH* of 7-7.2 when definite quantities of raw sludge were added daily. In order to answer this question, a quantity of sludge about eight to ten days old was obtained, containing, as indicated in Table I, 75.8 per cent volatile matter, 36.0 per cent ether soluble matter and with a *pH* of 4.9.

As in the case of the seeding materials dealt with above, this sludge was divided into two parts. Each part, which contained 250 grams of dry solids, was put into a separate 5-gal. bottle and incubated at 28 deg. C. The *pH* was adjusted with hydrated lime to 7-7.2, and was kept at this reaction during the experiment. Raw sludge was added daily to the two bottles, amounting to 2 and 6 per cent of the dry solids originally present. Weekly withdrawals of sludge were made so that 250 grams of dry solids always remained in each bottle. The experiment was conducted exactly the same as the previous work. The raw sludge, which was added daily, however, was not identical with that used in the preceding work. The curves shown in Figs. 9 and 10 were, therefore, not incorporated in Figs. 1 to 4. More lime was needed to keep the reaction at approximately 7.0 than the quantities reported in Table II. At seven different times lime, amounting to a total of 80 grams, was put in the bottle receiving the 2 per cent additions of sludge, and 150 grams, applied at ten different times, were put in the bottle, in which 6 per cent additions were made.

Results—The changes in the volatile solids and ether soluble matter are given in Figs. 9 and 10. Volatile solids dropped rapidly in each bottle during the first twenty or thirty days. The sludge to which 2 per cent additions were made did not show a much further reduction until about 110 days. At the end of 150 days this material was digested. However, the other sludge, which received 6 per cent additions, never was digested, the volatile solids being nearly always above 65 per cent. Ether soluble matter did not show much variation after about 20 days. As there was a rapid reduction in ether soluble matter during the first fifteen or twenty days, it


Volatile solids in raw sludge added daily to the 2 bottles
6% daily sludge additions
2% daily sludge additions
FIG. 9
Ether soluble matter in raw sludge added daily to the 2 bottles
6% daily sludge additions
2% daily sludge additions
FIG. 10
Per Cent Volatile Solids
Per Cent Ether Soluble Matter
Days

Figs. 9 and 10—Changes in volatile solids and ether soluble matter

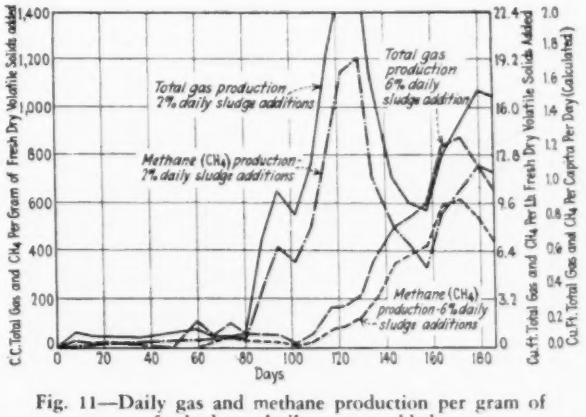

Total gas production 2% daily sludge additions
Methane (CH_4) production 2% daily sludge additions
Total gas production 6% daily sludge additions
Methane (CH_4) production 6% daily sludge additions
C.C. Total Gas and CH_4 Per Gram of Fresh Dry Volatile Solids added
Cu. Ft. Total Gas and CH_4 Per Lb. Fresh Dry Volatile Solids Added
Cu. Ft. Total Gas and CH_4 Per Capita Per Day (Calculated)
Days

Fig. 11—Daily gas and methane production per gram of fresh dry volatile matter added

would seem that certain of these substances digest rapidly. After this period the further reduction in volatile solids is due to the decomposition of other compounds.

Part II of Table III gives the quantities of gas produced during the 187-day period of digestion. The quantities of methane obtained per gram of volatile matter destroyed was 789 c.c. in the case of the 2 per cent additions and 541 c.c. in the case of the 6 per cent additions. Gas production was therefore relatively greater in the former than in the latter case. It is also worthy of note that the percentage of carbon dioxide evolved from the latter sludge was greater. This result was to be expected as the sludge never reached the more advanced stages of decomposition.

Fig. II gives the daily quantities of total gas and methane produced from the fresh volatile solids added daily. In those bottles to which 2 per cent additions were made there was little gasification until after 81 days. From then on digestion was rapid for a considerable period. The quantities of gas given off from the 6 per cent additions was much less than from the 2 per cent additions, and there was little gasification until after about 120 days.

Conclusions

The results of the experiments, in so far as they apply to Baltimore sludge, would seem to indicate the following:

1. Each gram of volatile matter destroyed or lost, as determined by present-day testing methods, will be converted into about 750 to 800 c.c. of methane and 1,200 to 1,300 c.c. of total gas. Each gram of raw volatile matter digested will produce about 600 c.c. of methane and 800 c.c. of total gas.

2. Sludge which is several years old serves just as well for seeding purposes as sludge which has just reached a digested condition.

3. Partly digested sludge, even though it contains as much as 65 to 70 per cent volatile matter, becomes digested within about 60 days when 2 per cent daily additions of raw material are made, and within 70 or 80 days when 6 per cent additions are added. When raw sludge, in place of a digested or partly digested sludge, is used, 150 days is required to obtain a ripe material in the case of 2 per cent additions. Where 6 per cent additions were made, a digested sludge was never obtained.

4. The sludges receiving the 2 per cent additions were slightly better digested than those to which 6 per cent was added. The difference, however, was not great. It is believed that 6 per cent additions are about the maximum which can be made and still produce a sludge with good drainability free from odors. It should be noted that the results were obtained in the laboratory under carefully controlled conditions. Large-scale field experiments would most likely give different results.

5. The curves shown in Figs. 3 and 4 indicate that certain ether soluble materials digest rapidly within ten or fifteen days. There is present, however, ether soluble matter which digests at a slow rate.

The Baltimore sewage-works are under the general supervision of C. F. Goob, chief engineer of the department of public works, and M. J. Ruark, sewerage engineer, with G. K. Armeling, superintendent. Acknowledgements are due to J. W. Bushman, who assisted in making the chemical analyses.

California Grade-Crossing Accidents Decrease

Grade-crossing acidents in California during 1930 were 6 per cent less than in 1929, and the resulting casualties were 10 per cent less. There were 2,755 accidents of this type during 1930, resulting in 204 deaths and the injury of 877 persons. Traffic accidents in the state during 1930, on the other hand, totaled 31,019, compared to 26,921 in 1929, or a gain of about 10 per cent, the deaths from motor accidents increasing from 2,244 to 2,384. Decrease in grade-crossing accidents, as compared to the 10 per cent increase in motor accidents, is attributed to the provision of protective devices at grade crossings and the increasing caution of motorists as a result of educational campaigns.

Oil-Penetrated Earth Roads at Four Cents a Yard

New procedure involving salvage of old oil mat has reduced retreatment costs in Los Angeles County to less than half a cent a square foot

By W. W. SHELBY
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RECENT EXPERIENCE in oil treatment of earth roads in Los Angeles County, Calif., is deserving of mention because: (1) several innovations in practice have been introduced; (2) an unusually large mileage is being surface-treated; and (3) information concerning the oiling of soils as they are found is very noticeably lacking.

The soils of Los Angeles County cover a wide range, from the sands to very heavy clays. It has been the practice for years to root, disk, water, shape and roll earth subgrades and then penetrate them with a suitable refined road oil. This process has been repeated as often as was necessary. In most cases it was a yearly procedure. It has been found recently that a subgrade once properly prepared need not be torn up to restore its riding qualities but can be given a light surface planing and be resealed or repenetrated with oil. This preserves the advantages of the compaction due to years of traffic, which is admittedly superior to that which can be obtained from a roller on a newly rooted grade.

Retreatment Procedure

An oiled earth road is failing when its waterproofing coat of oil has worn so that small and isolated patches of unoiled earth are exposed or when corrugations are distinctly noticeable. It has failed when holes are large and numerous, or when corrugations are very pronounced. Assuming that maintenance is undertaken when it begins to fail, not after it has failed, the method is as follows:

A caterpillar-drawn disk scarifier, with a grader hitched behind, restores the smoothness of the road by cutting off the high spots and also removes a portion of the old cake to prevent subsequent corrugations from excess oil. This disk has four gangs of twelve disks each. It has a cutting width of 4 ft., the disks are 2 in. apart, and the machine weighs 3½ tons. Weight is essential to success. The disking is continued until the objectives mentioned are secured. Usually it is found desirable to disk the surface twice, but this depends upon the condition of the road, the kind and hardness of the oil cake and the temperature.

Considerable experience is needed in operating the disk. The instructions are to cut lightly at the expense of more trips, rather than to endeavor to accomplish the results with one trip. Road oils of high asphaltic content are susceptible to this surface smoothing. However, to disk road oils successfully of more than 90 per cent asphalt, advantage is taken of the hot summer months. The lighter oils cut more evenly and rapidly and with less labor. During hot weather, wetting immediately before the machining will prevent the oil cuttings from adhering to the wheels. The cuttings are bladed to the gutter line and removed. This process has long been

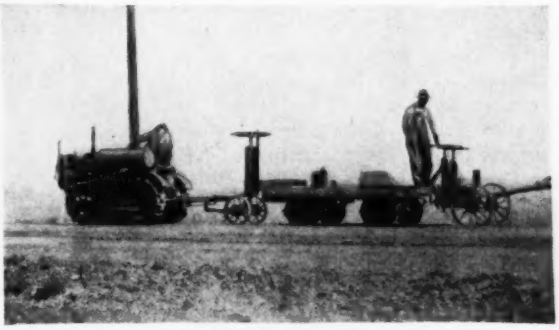
a standard method of restoring the riding qualities of rock and oil-wearing surfaces of 2 in. or more in thickness, but we think its successful and almost universal application to oiled-earth roads is not generally known.

Selection of Oil

The proper selection of the quantity and quality of oil for the penetration or sealing of a given soil requires some experience and much good judgment. However, there are certain fundamental principles that govern, if the conditions of the case are properly diagnosed. As an illustration, three typical cases on heavy clay soil are selected:

1. Road previously sealed with 90 per cent asphaltic oil, disk exposed small percentage of unoiled grade.
2. Road previously sealed with 90 per cent asphaltic oil, disk exposed large percentage of unoiled grade.
3. Road previously sealed with 60 per cent asphaltic oil.

1. With a small amount of grade exposed and that thoroughly compressed, because it is clay and has been under traffic, and with the excess oil removed from the



Disk scarifier and blade grader prepare surface

remaining portions, ¼ gal. of 90 oil per square yard and covering are advocated. If the old oil cake is hard and the possibility of corrugations appears remote, ¼-in. crushed rock is used for the cover. If the old oil is fairly active or fresh, a cover of crushed granite is used. This granite is a local material and very decomposed; it grinds easily under traffic and hence is daily furnishing additional fines to absorb any slight excess of oil that may appear. In lieu of the granite cover ⅛ gal. of 90 oil and sand are suggested. The amount of oil used in sealing is reduced if sand is used, because sand and 90 oil will corrugate more rapidly than if granite were used. The endeavor is always to use the smallest amount of oil that will accomplish the waterproofing.

2. With a very appreciable amount of unoiled earth exposed by the disk, it is doubtful if 90 oil would adhere to the grade. In this case ¼ gal. of 60 oil per square yard is used. This oil will penetrate the grade to a slight extent and has sufficient asphaltic content to leave a waterproofing coat, though of course not so watertight as the heavier oil. The 60 oil will have a softening tendency on the old 90 oil, but it must be remembered that the disk has previously removed a large percentage of it. The 60 oil is never covered with crushed rock; sand or decomposed granite is preferred.

3. If a road has been previously sealed with 60 oil, a large percentage of the subgrade is usually exposed, as it cuts more readily with the disk. Hence, it is resealed with ¼ gal. of 60 oil for its penetrating value rather than assuming the risk of the heavier oil not adhering to the unoiled exposed portions. At times just the opposite has been done, sealing with 90 oil and rock. However, this is a dubious practice and is attempted only after the disked grade has been open to traffic to whip off thoroughly all loose particles and when the old 60 oil is very hard. If the 90 oil seal is attempted, sweep the road well just prior to oiling.

Having oiled, a light drag is a desirable adjunct to keep the road covered with sufficient loose material to prevent the fresh oil from picking up. This dragging will also assure a more even distribution of the cover. The dragging is, of course, a temporary expedient only.

Representative Surfacing Costs

The following table shows comparative costs between the method just described and the old method of rooting the road some 4 in. or more deep.

	—CLAY— Cost Per Square Foot		Per Cent Decrease	—SAND— Cost Per Square Foot		Per Cent Decrease
	Old	New		Old	New	
Subgrade preparation	$0.0022	$0.00056	75	$0.001	$0.005	50
Materials, labor, etc..	0.0048	0.00379	21	0.0043	0.0033	23
	0.0070	$0.00435	38	$0.0053	$0.0038	28

The total cost per square foot of $0.00435 represents the exact cost of a project just completed that covered 1,149,500 sq.ft. The cost of $0.007 per square foot was obtained by the same road foreman two years ago working on the same streets, but by the old method of rooting. It is noted that the cost of subgrade preparation shows a decrease of 75 per cent. This method of restoring the riding qualities and removing the surplus oil is naturally independent of the underlying soil. At present only ¼ gal. of oil per square yard is used, where formerly ½ gal. was necessary to accomplish the same result, because much of the old oil remains intact. This decrease

An oil-treated Los Angeles County earth road

in the amount of oil necessary is reflected in the 21 per cent decrease in cost of materials, labor, etc.

The same explanation holds true of the cost on sandy soils. The difference of $0.00049 between the materials and labor cost of the sand and clay work under the new method is explained by the difference in efficiency of the two foremen and the tendency of one to use more cover than the other. In rural districts this cost is further decreased to slightly under $0.002 per square foot by using the natural soil as a cover and spreading it with a grader. It can now be said that the grade cost is approximately 0.05c. per square foot, irrespective of the type of soil, where it was formerly 0.1c. in sand and about 0.2c. in clay, that only one-half the amount of oil is needed and that the total average cost is approximately 0.4c. per

square foot in urban sections and 0.2c. per square foot in rural districts.

With oiled-earth roads 20 ft. wide for from $200 to $425 per mile, it is thought that the days of the old muddy trails should be a remembrance only.

Acknowledgment is made to F. H. Joyner, consulting highway engineer, for suggestions and criticisms of this article and to the foremen and men whose interest and cooperation make these costs possible.

Stewart Mountain Dam Completed

COMPLETION of the Stewart Mountain dam finishes the third stage of the power and storage development program on the Salt River east of Phoenix, Ariz., by the Salt River Valley Water Users' Association. Backing water to the foot of the Mormon Flat dam, the new reservoir of 70,000 acre-ft. capacity assists in the economic utilization of the stream for irrigation and provides a head of 116 ft. for a 17,500-hp. hydro-electric plant. The principal features of the structure, recently described by C. C. Cragin, chief engineer of the association (*New Reclamation Era*, November, 1930, p. 214), are outlined in the following.

In granite formation, the canyon is about 1,100 ft. wide at crest elevation, with a depth of 119 ft. to streambed. The original plan for a multiple arch at this site was changed when exploratory work revealed bedrock at a depth of 90 ft. below streambed. The revised plan provides a central arched section 212 ft. high above lowest foundation, thrusting against reinforced-concrete abutments. Gaps between these abutments and the upper canyon walls are closed by gravity sections, the one on the east with a maximum height of 107 ft. is 267 ft. long and carries the spillway equipped with nine tainter gates. Discharge capacity of the spillway is 150,000 sec-ft.

The arched section was designed by the trial-load method first used in the design of the Horse Mesa dam on the same stream. The arch is 8 ft. thick at the top, with an extrados radius of 273 ft., and 33 ft. thick at the base. Characteristics of the lower arch rings produce a maximum downstream overhang of 10 ft. at the crown. The limiting concrete stress used in design was 650 lb. Although of heavy gravity section, the abutment buttresses are reinforced to provide against cracks. The outlet works consist of a 13½-ft. penstock supplying the single 17,500-hp. generating unit in the power house at the base of the dam, two 7-ft. outlets discharging through 54-in. needle valves, and an 8-ft. reserve opening blanked off at present.

Foundation construction was carried on between two steel sheetpiling cofferdams driven to bedrock. These cofferdams, supported by timber walling designed for maximum working space, permitted effective excavation work 90 ft. below streambed.

The concrete plant consisted of two 1-yd. mixers with a steel tower and counterweighted chute-conveyor system suspended from high lines. Plant capacity was 1,000 cu.yd. of concrete in two shifts. Construction operations were carried out along the entire structure practically simultaneously, the gravity sections being completed while excavation was in progress in streambed. Concrete placing on the overhung section of the arch was carried up approximately level to avoid unnecessary tensile stresses. The total concrete yardage in the dam and power house is approximately 122,000 cu.yd.

Water-Works Practice Abroad

Trends of current practice in England, Scotland, Ireland, France, Straits Settlement and Nigeria

THERE IS a family resemblance in water-works design and construction the world over, with variations due to differences in local conditions. As a matter of interest to water-works men in this and other countries the most outstanding features noted in a review of water-supply engineering in 1930, published in the London *Engineer* of Jan. 9, 1931, have been selected for presentation here. For quick comprehension of practice in the several divisions of water supply the material abstracted has been grouped topically, instead of being given by countries, alphabetically, as in the original. —EDITOR.

MOST of the water-supply extensions specifically described draw from surface sources, but there are some interesting exceptions—besides numerous supplies from bore holes from 4 in. to 10 ft. in diameter.

Other Sources of Supply—At Perth, Scotland, a single-filter gallery system replaced two galleries, one or both of which had been in use since 1832. The new gallery system is 2 miles up the River Tay from the old ones, which were considered to be liable to sewage pollution at high tide. At Kano, Nigeria, infiltration wells, sunk to rock in a riverbed, were under way as a part of a new water-works system. These wells are described as "concrete cylinder" intakes, sunk to rock "to draw water through porous faces and inlets" from the sand beneath the riverbed. Each well is equipped with a pair of turbine pumps.

For Paris and its suburbs the engineers continued preliminary work for raising water from below the sandy bed which was formerly covered by the Loire, but drawing on this source is opposed by the chambers of commerce in that district. Parliamentary sanction for the Loire underground project has not been obtained. All other sources of supplies have been exhausted, including the Marne and the Seine. If the reservoirs under construction in the upper valley of the Seine were to be drawn upon, they might be rendered ineffective for regulating the level of the Seine in times of drought. At Lyons more wells are being sunk in the sandy bed of the Rhone.

To aid rural France the government has voted money for water supply and placed its technical services at the disposal of the communes to give advice. Last summer's drought deprived many places in Southern France of water, while in other sections of the country primitive arrangements are a standing menace to health.

Impounding Dams and Reservoirs—Under parliamentary legislation of 1930 no large reservoir can be built in England or Scotland unless "a qualified civil engineer" is engaged to design it and supervise its construction. The act applies to all reservoirs with a capacity of more than 6,000,000 gal. (The British gallon has been converted to American gallons throughout this article by adding one-fifth.) The qualified civil engineers described by the act must be chosen from the panel of civil engineers—which apparently differs for different classes of reservoirs. These panels are appointed by the Secretary of State in conjunction with the Ministry of Health in England and Wales and the Department of Health for Scotland.

For difficult construction the lead is taken by Belfast, Ireland, where a cutoff trench with a maximum depth

of 212 ft. was completed, the concrete wall poured and the embankment to form the Silent Valley reservoir started during the year. The material encountered in trenching was of so troublesome a character as to necessitate sinking fourteen shafts under compressed air and the use of cast iron to support the sides of the trench for a length of about 450 ft. in the neighborhood of the bed of the preglacial river. Rochdale, England, is to build an earth dam with a cutoff trench averaging 105 ft. deep, the dam to be 2,790 ft. long and to extend about 90 ft. above ground level.

At Wakefield, England, the "heel trench" of a granite-faced concrete dam 100 ft. high was carried down 50 to 80 ft. below the ground level, and the underlying rock was grouted with 1,000 tons of cement, placed in drill holes 200 ft. long, driven vertically, on an incline and horizontally, totaling 9,964 ft. A rather high dam, called Scar House, was nearly completed for Bradford, England. Its top-water level is 154½ ft. above the bed of the River Nidd. It has a 300-ft. granite spillway at its center.

The most capacious reservoir in the year's category—described as one of the largest of its kind in Scotland—was completed for the Lanarkshire water-supply area. It has a capacity of 2,525 m.g. and is formed by an earth dam, with a puddled clay corewall carried to rock. The dam is about 90 ft. above the bed of the Camps Water, about 900 ft. long and some 510 ft. thick at the base. The reservoir will supply about 14.4 m.g.d., of which a third will be "compensation water to the stream."

A total of 2,833 acres of land immediately surrounding Lake Vyrnwy, the main source of water supply of Liverpool, England, had been forested at the close of 1930. New stock is now provided from four nurseries having a total area of twelve acres, which are producing about 750,000 "plants" annually. In 1912, after the city had planted 875 acres, a "partnership was entered into" with the national treasury to plant an additional 4,000 acres within twenty years, or by 1932. The war retarded the work, so only a little less than half of the program was carried out.

Aqueducts, Tunnels and Trunk Mains—The well-known aqueducts (pipe lines) of the Manchester, Birmingham and Liverpool water-works were being reinforced in capacity. Start was made on a tunnel section of the new Haweswater aqueduct for Manchester, and two other tunnel jobs were reported. Most of the major water-supply conduits, completed or under construction during the year, were of steel; but in several instances cast-iron pipe, usually rather small, was used.

The Aber tunnel, to serve as an alternative "draw-off" from Lake Vyrnwy for the Liverpool water supply, was holed through on Nov. 6. Although this tunnel is only 7 ft. in diameter and 9,926 ft. long, it has been under construction since January, 1922. There were only two headings, one at each end, and until 1928 work was confined to the inlet heading. About 600 ft. of the length was in earth and the rest in rock. The placing of a brick lining has been ordered. The new tunnel emerges, at its lower end, close to the outlet of the existing tunnel, from which pipe lines extend to Liverpool. Manchester let a contract for a tunnel 4¾ miles long, comprising the northernmost end of the Haweswater aqueduct. This aqueduct will include other tunnels, cut-and-cover work and pipe lines.

Manchester now has booster pumps on all three of the pipe lines forming its main aqueduct, the third line having been so equipped in 1930. Manchester also installed during the year booster pumps on two 30-in. high-level trunk mains, for use in case of a breakdown of the supply from Godley.

On the Elan aqueduct of the Birmingham supply about 17½ miles of the third conduit was completed and put into use, and an additional 5 miles of the third main was authorized for construction in 1931-32, and a contract for the necessary 60-in. steel pipe was let. On the Vyrnwy aqueduct of the Liverpool supply 5½ miles of the third pipe line was put in use. On this and also on two other sections of the third line, 42-in. steel pipe was used, $\frac{7}{16}$ in. thick, lined with $\frac{3}{8}$ in. of bitumen, applied centrifugally, and covered on the outside with a double spiral wrapping of cloth thoroughly impregnated with hot bitumen. The major part of the straight pipe of this third section was 30 ft. in length, as compared with 25 ft. on the earlier sections.

Other bitumen-lined steel conduits completed or under construction in Great Britain ranged in size from 12 to 30 in., including 13 miles of 30-in. pipe for Preston. The work was done entirely "with unemployed labor by direct administration." Mannesman tubes were laid at Coventry on a 27- to 18-in. steel pipe line.

Extensive use of cast-iron pipe by the Lanarkshire water-supply area, Scotland, is reported in connection with a new gravity conduit 30 miles in length, of which 28½ miles is 30- and 27-in. cast-iron pipe; over a mile is in tunnel, and a short summit length is of concrete.

There is reported from Singapore, S.S., a 30-in. steel pipe line about 3½ miles long. Another report comes from Kano, Nigeria, concerning a 14-in. force main with flexible joints.

The London Metropolitan Board used cast iron for a 30-in. line, 36,000 ft. long, and steel for a 24-in. line, 18,150 ft. long. The steel pipe was "dipped in Dr. Angus Smith's solution and coated externally with an asphaltic compound."

Pumping Plants—In number, centrigual pumps are far in the lead in the new installations reported, while for power oil-engines also lead in number. None of the pumping plants mentioned is large; most are quite small. For the London metropolitan district two steam-driven centrifugal pumps will have a capacity of 21.6 m.g.d. when working in parallel to deliver water at a low-lying reservoir, or half that when delivering to a high level. Another metropolitan installation is a 19.3-m.g.d. low-lift centrifugal pump, driven by a high-speed steam engine. At Oxford, England, a contract was let for four of five projected 250-b.hp. vertical oil engines, apparently to lift filtered water to a reservoir. Singapore, S.S., is about to install the first three of eight sets of 350-b.hp. horizontal engines to drive three-throw pumps.

Water Treatment—Little is said about new water-treatment plants. Two slow sand filters were added at Bedford. Apparatus for treating 57.6 m.g.d. of water for the London Metropolitan District with ammonia and chlorine was provided at the Kempton Park double-filtration plant on the Thames at Littleton. The same authority also installed an ammonia plant at Barnes in connection with new chlorinating apparatus. Iron removal is being introduced by Singapore, S.S., owing to an increased amount of iron salts in the supply (from surface sources?). For the same city an aeration and sedimentation unit of 1.8 m.g.d. is being installed, apparently to treat water before it goes to existing 7.2-m.g.d. rapid sand filters.

Strain Tests on Steel Plates Carrying H-Section Columns

Investigation at University of Minnesota indicates major portion of load is transferred along column flanges and that plate contact area depends on elasticity of foundation

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THE calculation of stresses in steel column base plates presents a problem that has not been solved to the satisfaction of many engineers. This article, which outlines a series of tests made by the authors, is presented to illustrate the transmission of a load from a column through a steel plate to an elastic resisting medium, and while it offers no direct solution of the problem, it should give a rational means of determining the distribution of pressure that causes the bending stress in the base plate. Before discussing the tests, however, it may be of interest to review the assumptions made in the commonly used formulas for calculating the required size and thickness of base plates.

The Carnegie formula assumes that the column is a rectangular load in the middle of the plate, that a uniform resistance acts under the slab, and that the maximum moment occurs at the center of the plate. The formula in the American Institute of Steel Construction handbook, 1928 edition, assumes the column load to be concentrated on the four corners of the column, so that "the web area is practically relieved of pressure by the dish or saucer-like action of the slab." However, the 1929 edition of this same handbook reads: "The column is assumed as having uniform bearing on the slab over the entire area of the milled end of the column shaft. It is also assumed that a part of the slab which is the smallest rectangle which will inclose the column cross-section will act as a continuation of the column and that the maximum bending moment in the slab will occur at the sides of this rectangle."

The American Bridge Co., in calculating its tables of slabs, has made assumptions similar to those of the American Institute of Steel Construction, but the assumed planes of fractures are, respectively, 80 and 90 per cent from the center of the column.

David C. Coyle, in an article, "Some Remarks on Column Footings" (*Engineering News-Record*, June 26, 1924), proposes to show that the uneven distribution of the load under an H-column justifies the use of the moment $\frac{1}{10} W(A - a)$ instead of the Carnegie $\frac{1}{8} W(A - a)$. R. Fleming's article, "Proportioning Steel Slabs for Column Bases" (*Engineering News-Record*, June 9, 1927), shows the widely divergent results obtained in proportioning base slabs by the different methods in common use.

In the tests herein reported, two sizes of columns were used—namely, 4-in. H 13.8 lb. and 6-in. H 24.1 lb. The column base plates were 16 in. square and the foundation bases on which they were tested were 22 in. square. Three types of foundation bases were used. The first consisted of four sheets of a wood-pulp composition board; the second was a four-layer grillage of pine boards; and the third was of concrete 9 in. thick. The columns were 2 ft. long and milled at both ends.

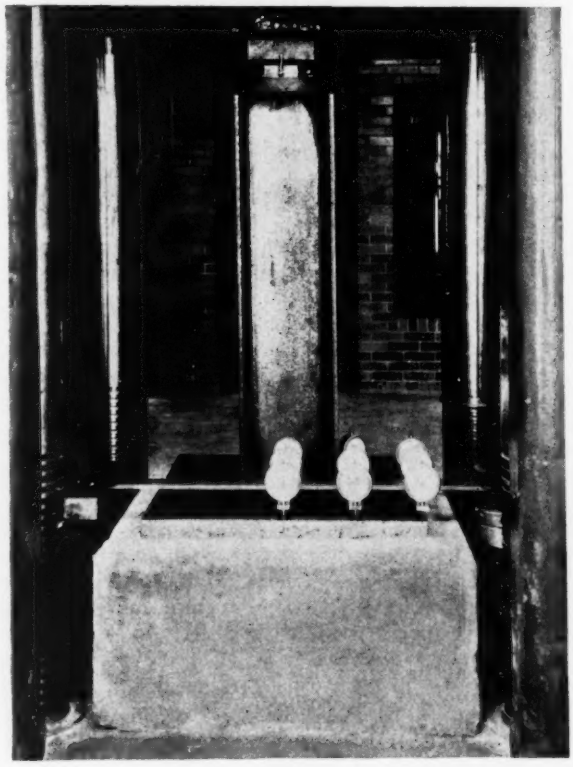


Fig. 1—Set-up for testing load transfer through steel plates
Deflection measurements taken by nine Ames dials, placed in one quadrant of plate.

The set-up for a test is shown in Fig. 1. The deflection of the plate was secured by a set of nine Ames dials reading direct to 0.001 in. The load was applied in increments, and readings were taken on the dials before and after each increment. These readings were plotted as contour lines, the assumption being made that the deflection of the other quadrants would be the same as the quadrant covered by the dials. The numbers on

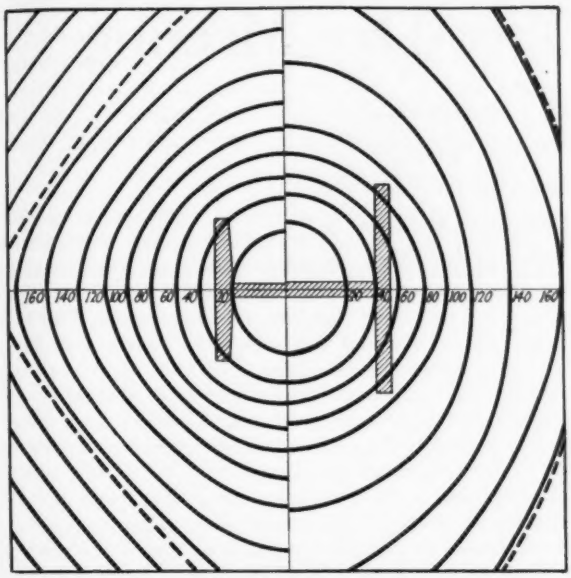


Fig. 2—Contour lines for ½-in. steel plates on a 9-in. concrete base

Plate at left loaded through 4-in. H column; plate at right through 6-in. H column. Dotted lines indicate limit of area of contact between plate and foundation. Maximum load in both cases 40,000 lb.

the contour lines indicate the relative deflection of the plate, each being the average of at least two tests.

Exceptional care was taken to provide continuous contact between the plate and column and between the plate and base before any load was applied. Irrespective of the type of base, these tests showed that a plate bends most about the axis perpendicular to the web of the column. This appears to be in contradiction to the findings of Kenneth G. Merriam, as reported in *Engineering News-Record*, Nov. 21, 1929, p. 811. However, the fact that the foundations in the tests of Professor Meriam had different properties than the foundations described in this paper may, in part, account for the contradiction.

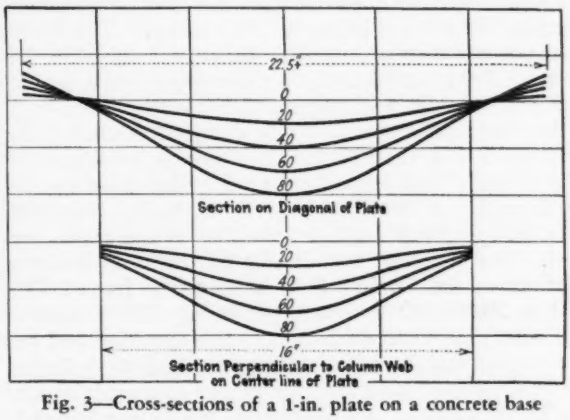


Fig. 3—Cross-sections of a 1-in. plate on a concrete base

Load transmitted through a 6-in. H-column, and sections drawn for 20,000-, 40,000-, 60,000- and 80,000-lb. loads.

From the shape the plate took it was evident that the column load was concentrated on the flanges. It is of interest to note that when the foundation base was of concrete, the corners of the plate deflected upward and away from the base—that is, only the central portion of the plate transmitted pressure to the concrete. It was also found that the less elastic the foundation base the more the column base plate bent and the smaller the area of the flange that was in contact with the plate.

Results of Tests—In Fig. 2 are shown the contour lines, referenced to the lowest point on the plate, for a ½-in. steel plate supported on a concrete base. The corners of the lower surface of the plate outside the dotted contour were not in contact with the concrete base whenever a load was applied to the column, so that only the portion of the plate within the dotted contour transmitted pressure. The pressure exerted varied from zero at the dotted contour to a maximum at the center of the plate.

Cross-sections of a 1-in. plate supported on a concrete base are shown in Fig. 3. The load was applied in increments of 20,000 lb., and a section is drawn for each increment. From the diagonal section it will be noted that the corners of the plate elevate above the concrete base at about the same point for every load. It may also be concluded from this figure that equal increments of load produce the same increment of deflection at the center.

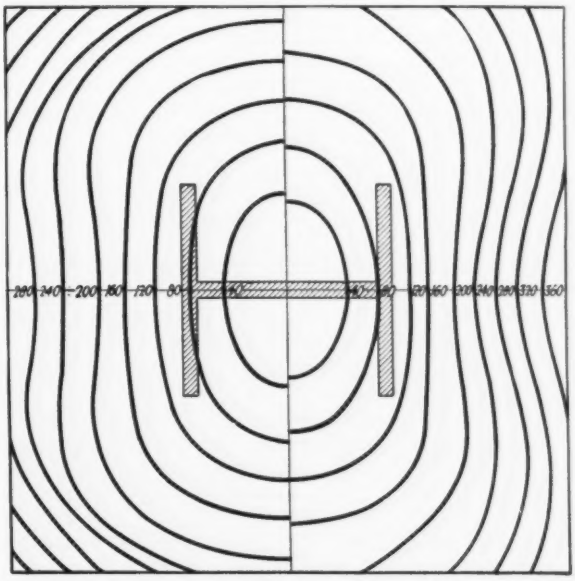


Fig. 4—Contour lines for ½-in. plates on yielding bases

Plate at left on a wood-pulp composition-board base. Plate at right on a plank grillage base. Left-hand plate loaded to 6,000 lb., right-hand plate to 10,000 lb.

The contours of a ½-in. plate when supported on a wood-pulp composition base of four ½-in. sheets and on a wood grillage base are shown in Fig. 4. The wood grillage consisted of four layers of ¾x3¾-in. pine boards laid flatwise with the boards in each layer laid at right angles to the adjacent layer. For these two bases the bending of the plate about an axis perpendicular to the web was more pronounced with the concrete base. The corners of the plate do not leave the base, and therefore the entire area of the plate transmits pressure. The least pressure is at the corners and the maximum at the center of the plate.

Conclusions—From these tests, it is concluded: (1) that for a square plate, the major portion of the load from an H-column is transmitted to the plate along the flanges of the column; (2) that the contact area between the plate and its base is a function of the elastic properties of the base, the thickness of the plate and the location of the application of the load. This area is not a function of the magnitude of the load so long as the foundation is elastic.

A.R.E.A. Has Busy Two-Day Meeting

Reports received from 27 committees—New study of rails initiated—Appropriation announced for research as to causes of and remedies for transverse fissures and other defects in steel rails—Steel and concrete specifications revised

INTENSIVE presentation of reports, combined with a minimum of active discussion, enabled the American Railway Engineering Association's convention, held in Chicago on March 10 and 11, to put through in a two-day five-session meeting about the same amount of material as it handles ordinarily in a three-day meeting with six or seven sessions. However, the hope was expressed that it will not be necessary to repeat such a concentration of activities. The industrial depression and its effect upon the railways was the reason for the shortened program and this was reflected also in reduced attendance, reduced membership and reduced finances of the association, although its activities and the work of its committees have not slackened.

In the annual presidential address, delivered by G. D. Brooke (Chesapeake & Ohio), announcement was made of an agreement between the association, the rail manufacturers and the University of Illinois for a cooperative study of rail specifications and mill practice with a view to the production of rails of more uniform quality. Mr. Brooke dealt also with the development of the railway engineer as an operating official, noting that many engineers have been graduated into the operating department. The secretary's report showed a total membership of 2,791 on March 1, compared with 2,856 a year ago, a net loss of 65, including 36 losses by death. Officers elected for 1931-32 include: president, L. W. Baldwin, president, Missouri Pacific Lines; vice-presidents, J. V. Neubert, chief engineer of maintenance-of-way, New York Central R.R., and W. P. Wiltsee, chief engineer, Norfolk & Western Ry. The secretary, E. H. Fritch, and the treasurer, A. F. Blaess, were reelected.

Twenty-seven Committees Report

All but one of the 28 committees made reports and had these reports printed in advance, making about 650 pages, compared with 1,600 pages last year. As each committee had from two to a dozen sub-committees with individual reports, the number of subjects presented was more than 200. But the problem of securing real discussion of the more important subjects has yet to be solved.

Besides all these reports there were two addresses. One, by R. H. Aishton, president of the American Railway Association (and read in his absence), pointed out that under present conditions it is essential to concentrate upon matters that will aid in securing greater economy and efficiency and in rendering higher service. That the railroads must enlarge their research activities and must adopt and develop the store-door delivery system by means of trucks and containers in order to compete effectively with commercial truck service was a point urged by Francis Lee Stuart, president of the American Society of Civil Engineers, in presenting an address of greeting on behalf of that society.

Registered attendance at the meeting reached a total of 975, with 746 members, against a total of 1,311 a year ago. Part of this reduction was due probably to the fact that the signal section of the American Railway Association did not hold its usual meeting in connection with that of the engineering association. At the close of the meeting a medal was presented to George J. Ray, chief engineer of the Delaware, Lackawanna & Western R.R., on his retirement as an officer after several years' service as director, vice-president and president. A silver vase was presented to G. D. Brooke, retiring president, and a silver-mounted gavel to Lewis W. Baldwin, the new president. It was announced also that F. M. Thomson, district engineer of the Missouri-Kansas-Texas Lines, has been appointed by the International Railway Congress as a "reporter" to prepare a report on American practice in the use of mechanical appliances in maintenance-of-way, for presentation at the next meeting of the Congress, to be held in Egypt in 1933.

Rails and Rail Joints

An important item in the report of the rail committee was the announcement, noted also in the president's address, that appropriations have been made for research as to the causes of and remedies for transverse fissures and other defects in steel rails. Failures of rails rolled in 1924 were 110.7 per 100 miles of track in 1929, which is about the same as the five-year record for 1922 rails but an improvement over the poor record of 114.1 for rails rolled in 1923. Still further improvement is predicted for the five-year record of 1925 rails. Transverse fissures continue to increase, with 6,238 in 1929, against 5,358 in 1928, while the accumulated total is now 44,035 failures. The increase of 1929 over 1928 is due largely to 478 defective rails detected by special tests and removed from track before actual breakage. The Sperry detector car of the American Railway Association has tested 6,509 miles of track in 417 working days, or 15.6 miles per day, and has located 1,682 defective rails.

Intermediate manganese rails continue to meet favor and more than 650,000 tons are now in service, while experimental heat-treated rails are giving good results. In discussion, C. S. Churchill referred to the desirability of classifying rail failures according to the traffic carried, remarking that the density of traffic on different portions of the Norfolk & Western varies from 2,500,000 to 70,000,000 ton-miles per mile. The committee however, pointed to difficulties in this direction and has not yet arrived at a satisfactory method of including traffic density as a factor. Reference was made also to the introduction of a 152-lb. 8-in. rail by the Pennsylvania R.R. A progress report by the committee on stresses in track outlined the field tests on stresses in splice bars and bolts. In presenting this report Prof. A. N. Talbot explained the recent development of instruments for recording stresses in joints under traffic with heavy loads and high speeds.

For expansion spacing at rail joints, the track committee recommended a modification of the tables now in the Manual, reducing the spacing slightly for temperatures up to 50 deg. It also eliminated $\frac{1}{32}$-in. measure-

ments now specified, since such close measuring cannot be maintained in actual track. The committee also recommended the lubrication of the gage side of the outer rails on curves as a means of preventing excessive flange wear and consequently reducing track maintenance work and increasing the mileage made by wheels.

Roadway, Ballast and Ties

New information as to methods of roadbed drainage, submitted by the roadway committee, was adopted, to supersede that now in the Manual. A talk on drainage and slides, illustrated by lantern views, was given by G. E. Ladd, geologist, a member of the committee. New specifications for concrete posts were also adopted. A progress report on fence wire mentioned the successful use of copper-content wire and an experimental copper-coated wire. The committee also pointed out the damage done to galvanized wire by burning vegetation along the fences.

New specifications for broken-stone ballast, submitted by the ballast committee, were adopted. This committee is studying the cost, economy and service of prepared (that is, screened and washed) gravel ballast. It is also having tests made on different roads as to shrinkage of ballast.

A marked increase in the use of the standard tie specifications was noted by the tie committee. Its proposed rules for the use of anti-splitting devices, for handling ties before they go to the treatment plant and for seasoning in the yard at the plant were all adopted, with a change requiring at least 60 days' seasoning after treatment. An unusual amount of damage while seasoning occurred during the long and hot summer of 1930, especially where the use of anti-splitting devices had been neglected. In order to prevent loss of ties by decay from long storage before treatment, some creosoting companies treated large quantities of ties in 1930, even though the ties had then to be stored for use in 1931.

In discussion as to the life of treated ties, the chairman, W. J. Burton (Missouri Pacific), thought it reasonable to expect 20 to 25 years if tie-plates are used as protection against wear. When more railways have had in track for 25 years ties that are adequately marked for identification it may be found that this estimate is too low. A careful system of tie records as used on the Kansas City Southern Ry. was described by S. E. Shoup.

That concrete ties are in general uncertain as to life and performance was indicated by the tie committee's report on substitute ties, which listed numerous ties removed for disintegration and crushing. With the exception of 1,500 concrete ties laid on the Bessemer & Lake Erie R.R. in 1930, no new installations of substitute ties have been noted since 1928, so that with occasional removals there is a gradual reduction in the totals of both steel and concrete ties.

Terminals and Water Service

A review of the design features of profile and track layout of hump yards, especially where the gravity movements are to be controlled by retarders or track brakes, was submitted by the committee on yards and terminals. Another subject was the provision of parking and garage facilities for automobiles at terminals and passenger stations. This accommodation is becoming an important problem at stations in large cities, but is rarely furnished by the railways. At suburban stations, free parking is sometimes permitted in the station grounds, or a concession may be granted to a contractor under certain regulations.

Specifications for laying cast-iron pipe as submitted by the committee on water service and sanitation were adopted for the Manual, after eliminating the requirement that backfilling should be included in excavation measurements. Progress reports on a variety of subjects covered treatment of feed-water, protection of pipe lines from electrolysis, care of boilers while unused, automatic control of pumping equipment, and the supervision of water-treating plants. It was pointed out also that there is need for much greater standardization of water service materials and practice, both to facilitate the work and to reduce the large quantities of repair parts held in stock. In dismissing this committee, President Brooke referred to the valuable work of railway water service departments in maintaining water supplies during the long drought last year.

Bridges and Buildings

Modifications in the specifications for steel railway bridges, now in the Manual, as adopted on recommendation of the committee on iron and steel structures, include specifications for forged steel and revised specifications for punched and reamed work. Designs for heads of button-head and countersunk rivets were accepted as information. Increased use of copper-bearing steel for bridges and structural work was reported by the committee. From a study of longitudinal forces in relation to bridge superstructures and substructures the committee considers that the following figures, to be used in bridge design, will meet present conditions and make reasonable allowance for possible increase in power of brake equipment: (1) forces due to braking, 15 per cent of weight of locomotive and tender plus 5 per cent of weight of train, but not less than 350 lb. per foot of track; or (2) forces due to traction, 25 per cent of the weight on driving wheels.

Anchoring of track to prevent longitudinal motion on bridges with unballasted floors was reported upon by the above-named committee, from which it appears that there is general agreement on the desirability of holding the rails against creeping, if it can be done without introducing objectionable conditions. Of 47 railroads, 23 do not anchor the rails, whereas 24 anchor them in some cases but not universally. Of 26 railroads using rail anchors, 16 report no trouble and 10 report distorted trestles or bunched ties. An evident reason for the diverse opinions and results is that anchoring has been done without even approximate information as to the stresses to be resisted.

Typical plans providing floors of concrete slabs or of laminated timber decking covered with asphalt planks were submitted for wooden bridges over railway cuts. Objection was raised to the proposal of the committee on masonry to eliminating 1,500-lb. concrete in the clause specifying amount of water to be used. Such concrete was considered satisfactory for unexposed locations and it was voted to retain it in the specifications. In the discussion it was stated that strength and durability do not depend upon the same factors and that design should be based on permanence as the primary consideration, the mix being then determined to give adequate strength. Specifications for concrete poles for transmission lines were adopted. Other material, accepted as information, included the design of arches, the A.S.T.M. tentative specifications for high-early-strength cement, methods of waterproofing and damp-proofing concrete, and also methods of repairing deteriorated concrete.

Tentative specifications for concrete for railway buildings were submitted by the committee on buildings, with

a view to their being recommended later for the Manual. Structural welding and specifications for standardized one-story metal buildings were included as information. A notable feature of this committee's work was a lengthy report on escalators and passenger, baggage and freight elevators for stations and terminal buildings. So far there are few escalators in railway work, except those at rapid-transit subway stations.

Grade Separation and Grade Crossings

Distribution of cost of grade separation was considered by the committee on grade crossings, with the conclusion that no uniform distribution can be made, as it must be in accord with the benefits received by the several parties in each case. For this purpose the method now included in the Manual is considered satisfactory. It was pointed out that as protection is needed on account of increase in highway traffic rather than in railway traffic, the public should share in the cost of installation, operation and maintenance of such works. Conclusions as to uniformity in statutes governing crossing protection or elimination, submitted as information before being sent to the American Railway Association, provided that state railroad commissions should have jurisdiction as to requirements for grade separation and grade-crossing protection, no new crossings to be ordered or built without their approval and the distribution of cost to be determined by them. In the discussion it was pointed out that in grade separation projects two factors to be considered are the visibility conditions and the traffic. Revisions of the grade-crossing signals now in the Manual were submitted and adopted after some discussion as to the desirability of a light at the base of the signal.

Railway Economics

Benefits to be derived from reduction of train resistance by increased rigidity of track were noted in the report of the committee on economics of railway location. The results are the same whether the rigidity is obtained by stiffer rails acting as girders or by the use of a rigid support, such as the experimental concrete roadbed on the Pere Marquette R.R. The committee also developed the solution of a problem relative to the economics of location as affected by the use of electric locomotive. Of a different character was its discussion of the organization of field forces for railway location and construction.

A long report on methods of increasing the traffic capacity of railway with its existing facilities was submitted by the committee on economics of railway operation for the Manual. Although the value and importance of the report were acknowledged, its inclusion in the Manual was objected to, as the membership has not had sufficient time to consider it, and it is the association's custom to allow a year before accepting matter for the Manual. It was voted therefore to accept the report as information. Other subjects included the separation of charges for passenger and freight service and the effect of airplane, bus and motor truck business on branch line operation. The committee's report on a method of determining the comparative economy of flat switching and hump switching for freight yards was adopted for the Manual. The committee on signaling and interlocking reported that improvements in operating efficiency between 1920 and 1929 effected a saving of 26 per cent in train hours, "No small part of which is due to modern signaling."

Recent developments in maintenance-of-way practice, reviewed by the committee on economics of railway labor, include the lengthening of track sections, reduction of section forces, and transferring the heavier part of section work to extra gangs. The conclusions are: (1) that the amount of labor required for adequate maintenance has been reduced by improved methods and labor-saving devices, and (2) that large economy may be realized by transferring the heavier work to extra gangs. For maintenance and renewal on multiple-track lines it was urged that the work can be done with advantage and economy by diverting traffic. This plan should cause little interference with train movements, while operating conditions are better than when the work is done under traffic and so requires longer time.

As to the unemployment situation, J. L. Pickles (Canadian National) remarked that his road gives certificates to men laid off, entitling them to preference when men are being employed. An offshoot of the committee on economics of railway labor is the new committee on maintenance-of-way equipment, which presented its first report, suggesting methods of scheduling work for machines in order to use them intensively and also outlining the organization of gangs to operate tie-tampers. The importance of reducing repair work on machines was emphasized, with the recommendation that such work should be done in shops controlled by the department responsible for the operation of the machines, rather than in the main shops of the mechanical department.

Contracts and Records

That maintenance-of-way by contract is adopted only to a very limited extent is indicated by the statement of the committee on uniform general contract forms that there is no necessity for a special form of contract for such work and no demand by the railways for developing such a form. As to cost-plus methods in construction contracts, very rarely is a cost-plus fixed fee contract used without provision for adjustments in the fee according to variations in cost or quantities. The form of contract for cost-plus percentage with fixed maximum is also little used, while any variation from a fixed-fee basis can best be provided by a sliding-scale contract. But whenever changes in the fee are provided for, the term "fixed-fee" is erroneous and may prove misleading. It is the committee's recommendation that where limitations in the cost-plus-percentage are desirable the agreements should be in the form of: (*A*) cost-plus a fixed fee, or (*B*) cost-plus a stated sum with adjustments for varying conditions. But the former should not be used where changes in the amount or conditions of the work are desirable. Methods and forms for simplifying the work on accounts, valuation and depreciation, as required by the Interstate Commerce Commission, were submitted by the committee on records and accounts.

Miscellaneous Subjects

As the Manual has been approved by the American Railway Association, this action should aid considerably in the extended use of uniform practice, according to the committee on standardization. Revised clearance diagrams for bridges, platforms, tunnels and engine house doorways, submitted by the clearance committee, were adopted after some discussion as to cars of exceptional size now being considered by the mechanical division, A.R.A., and also as to handling very long piles and girders that are loaded on three cars. Specifications for levees, as presented last year by the committee on rivers and harbors, were adopted for the Manual, together with its report on dredges and specifications.

Fig. 1—A wall of steel sheetpiles is used along the deeper channels

Storm and Flood Protection at Port Arthur, Tex.

By J. B. CONVERSE
Consulting Engineer, Port Arthur, Tex.

Concrete and steel sheeting with grouted and welded joints form waterfront wall—Earth levees surround city—Stormwater drains and pumping stations provided to handle interior drainage

THE CITY of Port Arthur, Tex., 50,000 population, on the shore of Sabine Lake in Jefferson County, about 16 miles north of the Gulf of Mexico, has an elevation of 2 to 8 ft. above mean low water, and like other cities of low elevation along the gulf coast, it faces the constant menace of destruction of life and property by tropical hurricanes. In 1915 a hurricane produced a storm tide of El. 6.9 ft. and submerged the greater part of the city to a depth of approximately 4 ft. Improvements now under way to prevent the recurrence of such a castastrophe are being financed by a remission of eight-ninths of the ad valorem state taxes on real and personal property in precinct No. 2 of Jefferson County for twenty years. This precinct includes the city and about 100 square miles in the southeast corner of the county. The present valuation of nearly $60,000,000, based on 47 per cent of the county valuation, yields sufficient revenue under this plan to warrant the issue of bonds for $2,000,000 to finance the improvements. The construction of concrete and steel sheetpile walls along the waterfront is shown in Figs. 1 and 2.

In determining the height of storm-protection works, a review of tropical hurricanes in the Gulf for 40 years was made, with a study of their storm tides from Mobile, Ala., to Corpus Christi, Tex. These records, with local information as to the 1915 storm, proved conclusively that protection work carried to El. 10 would be required in the case of a hurricane passing inland just west of Port Arthur. On this basis 15 miles of levees are being built to a crest elevation of 10 ft., including a portion behind the concrete seawall. The crown width is 8 ft., and both sides slope 1 on 3. At openings to allow three steam and electric lines to pass, reinforced-concrete retaining walls will be built, having concrete corewalls extending back into the levees. In the faces of the walls will be slots for two lines of timbers, the space between which can be filled with sandbags if necessary. All highways and streets will pass over the levees.

East of the city the heavy traffic of the Sabine-Neches Canal is a problem, as wave wash has eroded the banks 75 ft. in some places. Waves set up by vessels reach a height of 2½ to 3 ft., and wind waves may reach the same height. Investigation showed little wave effect below El. —3, but above that level protection is needed for the banks as well as the levees. From the map, Fig. 3, it will be seen that the canal forms the waterfront of the city and is separated from Sabine Lake by a narrow strip of land.

Concrete Seawall—In selecting a type of construction for the seawall along the city front, the main factors considered were stability, first cost, life and maintenance cost. The design adopted for the concrete portion of the waterfront wall consists of tongued-and-grooved reinforced-concrete sheetpiling, surmounted by a concrete cap and ornamental rail or parapet, as shown in Fig 4. The top of the piling is held back by tierods 12 ft. apart, attached to concrete anchor blocks or deadmen 4x4 ft.

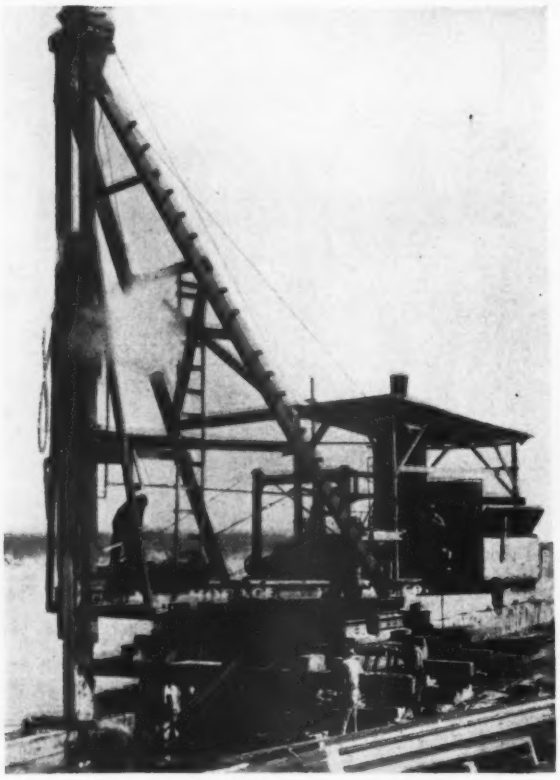


Fig. 2—Driving concrete sheetpiles

and 8 in. thick. To prevent corrosion these rods are painted with asphalt and wrapped with heavy tar paper. The top of the wall is at El. 5, which provides ample protection from erosion. Where the wall is adjacent to city property a concrete revetment slab will be placed between the wall and the levee, as shown. There are 4½ miles of this wall under construction at a cost of about $800,000.

Borings showed hard blue and yellow clay to El.—13, underlaid by 7 ft. of fine sand. Records of piling in the vicinity show that the clay has little bearing value, but that the piles are secure when driven into the sand. As this sand stratum is below wave action, there is no danger of undermining the wall. The water of the lake and canal is practically the same as that of water in the Gulf.

The concrete sheet piles, 19 ft. long, are 10x24 in. in section, with the bottom beveled on one side to insure tight driving. For the upper half the tongue is replaced by a groove, so that the wide groove formed by two adjacent piles can be grouted to make a watertight joint. The reinforcement consists of ten ¾-in. vertical bars, with ⅜-in. hoops spaced 3 to 10 in. All steel has 2½ in. of concrete cover. A concrete dry mix, 1:1½:3, is based on the water-cement ratio, with 5½ gal. per sack of cement and seven sacks per cubic yard of concrete. Volumetric proportioning is used for the aggregates, and frequent determinations of their moisture content are made, the amount of water being varied accordingly. The bulking factor of the sand is also watched, since the mix is based on dry materials. Weighing equipment would eliminate some of the tests and insure a more rigid control of the mix. Tests of the concrete show a compressive strength of 4,500 to 4,800 lb. at 28 days.

Making the Piles—Sand is delivered at the yard by barges, and cement and gravel by rail, the layout enabling a crane with clamshell bucket to stand between the canal and track and unload both barges and cars, placing the materials either in storage piles or in bins over the mixer. Cement is delivered on another track at the storehouse. Measuring hoppers discharge aggregates directly into the mixer; cement is added in the gravel bin. Concrete is hoisted in a bucket to a hopper from which it is spouted to buggies on an elevated runway, which has several branches from which the concrete is dumped into chutes leading to the pile forms. The reinforcement is made up in units which are placed in the forms, resting on six concrete blocks on the bottom, which is the shore side of the piles.

The yard is laid out for seven rows of piles, which are cast in stacks ten piles high, the layers being separated by non-staining tarred paper. The collapsible forms are stripped the day after pouring, and the concrete is then kept wet for ten days, the piles remaining in the yard for 36 days. A crawler crane loads them onto motor trucks for transportation to the work. Breakage in handling and hauling has been negligible.

Fig. 3—Storm protection for Port Arthur, Tex.

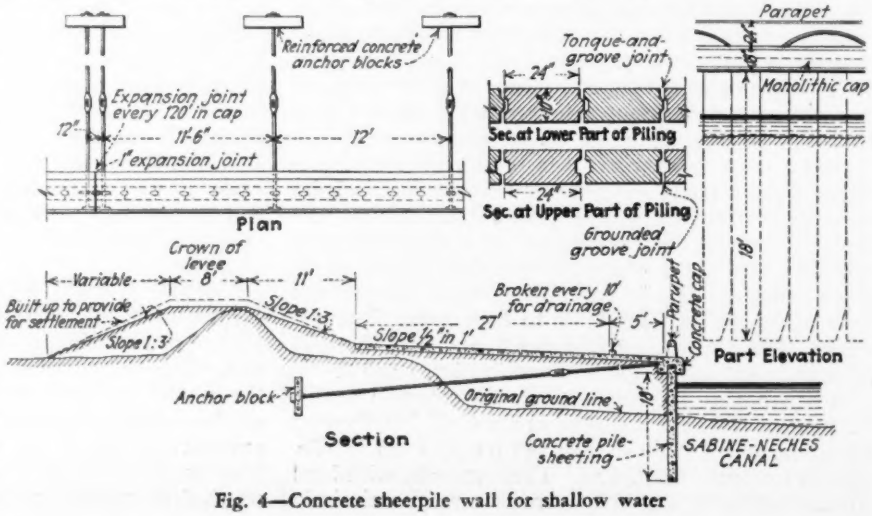


Fig. 4—Concrete sheetpile wall for shallow water

Driving Concrete Sheetpiles—Two piledriving rigs of the turntable type travel on wooden rollers on timber stringers, which are supported on the water side by the piling already driven and on the land side by false piles or blocking, depending upon the presence or absence of water. One of these piledrivers is shown in Fig. 2. Two 10x10-in. guide timbers 20 ft. long are clamped on each side of the completed piling and project beyond it. To admit the new piles, the space between them

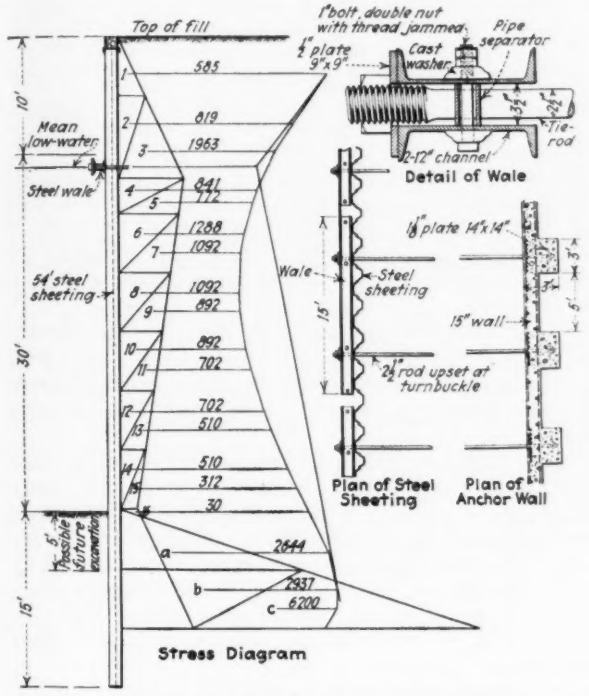


Fig. 5—Steel sheetpile wall for deep water

is maintained by a block and clamp at the free end. Since the pile has a tendency to crawl toward the water side while being driven, the guide timbers are held in alignment by a chain block attached to the free end and to a deadman on shore. For the cap and rail, forms are supported by bolts set in cored holes near the tops of the piles. Concrete for this work is mixed on a floating barge and placed directly into the forms.

Steel Sheetpile Wall—Commercial interests occupy the frontage along the canal for 1,750 ft., where the depth of water at the wall varies from 20 to 30 ft. It was deemed advisable and economical to construct this section with deep arch-web steel sheetpiling of copper-bearing steel. The piles are 54 ft. long and weigh 32 lb. per square foot. The section modulus required was 26.7 inches cubed, to obtain which the interlocks of alternate piles are to be welded. The design method used for this piling was that of Prof. Wolmar Fellenius, as described in *Engineering Record*, Sept. 30, 1913. This wall, Fig. 5, is anchored by tierods to a reinforced-concrete wall, steel waling for the anchor rods being placed 12 in. below mean low water. The piling is driven from the land side by a driver with 90-ft. leads, traveling on rollers supported by temporary piles.

Earth Levees—The 15 miles of earth levees surrounding the city (Figs. 3 and 4) vary in height from 3 to 8 ft., with crown widths of 8 ft. and slopes of 1 on 3. The levees along the canal behind the concrete and steel walls are being constructed by a revolving crane moving on rails laid on the decks of a barge, 50 x 200 ft. This crane, Fig. 6, has a 100-ft. boom and a 2½-yd. bucket. Materials are secured from the bottom of the canal at a depth of 40 ft. The remainder of the levees are being constructed with dragline machines taking material from borrowpits. All borrowpits are constructed to line, grade and dimension for use in handling internal stormwaters.

Internal Stormwaters—With the city surrounded by the protection works to El. 10, internal stormwaters will have to be removed by pumps. The city occupies an area of approximately 5,400 acres and has a normal annual rainfall of 51 in., while rainfall curves show intensities of 3.25 in. per hour. These stormwaters will be concentrated at a central pumping station having a capacity of 450,000 g.p.m., by means of a storm drain, which is a double 9x10-ft. reinforced-concrete box. Two other pumping stations are to be constructed, one having a capacity of 120,000 g.p.m. and the other 60,000 g.p.m. In addition to these new installations, the city has now in operation pumping units of approximately 100,000-g.p.m. capacity.

Engineers and Contractors

Preliminary investigations, plans and specifications for the project were prepared by J. B. Converse & Company, Inc., Port Arthur, Tex., and Mobile, Ala. The work is under the personal supervision of the writer and M. D. Gates, with W. C. Weatherby and G. Sims as field engineers. The W. Horace Williams Company, Inc., New Orleans, La., has the contract for the concrete and steel walls, with L. I. Martin as superintendent. Martin Bros., of Beaumont, Tex., have the contract for the levees, while the Stillwell storm drain is being constructed by the Central Contracting Company, Dallas, Tex. Bids for the pumping plants were received in November.

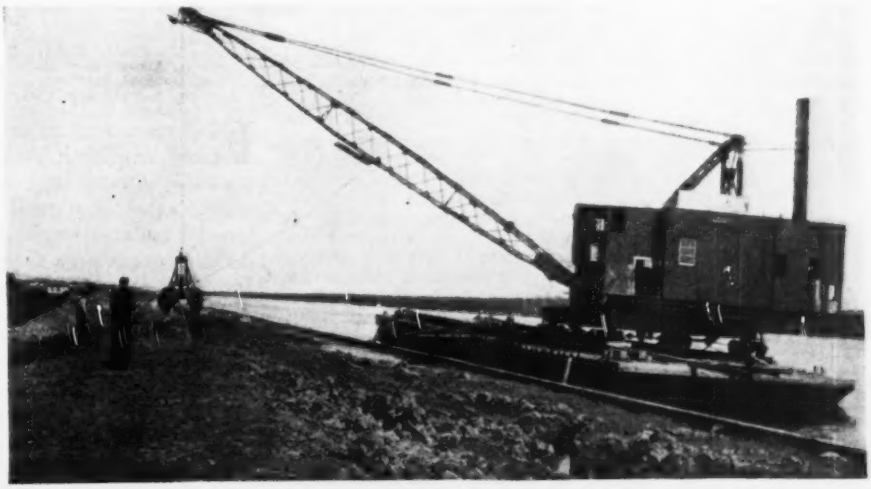


Fig. 6—Dredge building levee behind wall

ENGINEERING LITERATURE

A Monthly Review of Books and a Listing of New Publications

Progress in Water Bacteriology

REVIEWED BY HARRY E. JORDAN
Sanitary Engineer, Indianapolis Water Co., Indianapolis, Ind.

ELEMENTS OF WATER BACTERIOLOGY: With Special Reference to Sanitary Water Analysis—By Samuel Cate Prescott, S.B., Sc.D., Professor of Industrial Microbiology and Head of the Department of Biology and Public Health, Massachusetts Institute of Technology, and Charles-Edward A. Winslow, S.M., Dr. P.H., Professor of Public Health, Yale School of Medicine. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth, 6x9 in.; pp. 219; tables. $2.50.

PRESCOTT and Winslow's "Elements of Water Bacteriology" has long been an indispensable handbook in its field. When the first edition appeared (1904) water bacteriology was just growing into a reasonable unity following the preliminary reports of the A.P.H.A. Standard Methods committee from 1897 on—the original final report appeared in 1905. The Standard Methods assembles the bare bones of technique with little or no comment. The "Elements of Water Bacteriology" furnishes a series of comments upon the significance of the results. The two methods of approach to the technique of water examination are necessarily complementary and should continue separately.

Added material in the new edition of the handbook includes an adequate presentation of the use of inhibitive dyes in the isolation of B. coli; of the recent attempts to correlate source of pollution and type of the colon group found; of permissible density of the colon group in finished waters; and (too briefly) standards for swimming pool water quality. The reference list at the close of the volume has grown to 21 pp. and is now predominantly American. Presumably this growth of American reference material is largely due to the coordinating effect of standardization of methods. The very act of attempting to change the current method gives a definiteness—a direction to activity—that would not exist in an environment where laboratories could follow their own whims without fear of adverse comment.

In the preface is found a paragraph that admirably indicates the need for a broadminded revaluation of methods:

> It is the belief of the authors that the time has now come when the numerous methods, old and new, should be examined with the object of securing not only the greatest accuracy but the most practicable simplicity consonant therewith. One of the aims of water examination is to obtain a true picture of the present sanitary condition of a particular water which is used for domestic purposes. Another is to provide a means for quickly and accurately measuring the degree of purification secured by some special form of treatment employed to transform a questionable supply into one of satisfactory quality. A third is to provide definite data on the progressive changes which occur in the transformation of sewage or wastes into effluents which shall be free from danger of transmitting infection or producing other objectionable after-results. In all these cases accuracy of data, promptness in securing conclusive evidence, and simplicity rather than multiplicity of procedure are highly desirable.

More to the heart of the problem are the following statements (p. 84):

> As long as the present Standard Methods remain the established procedure of the American Public Health Association, they must be accepted and followed; for uniformity and comparability are the most vital essentials in any field of practical administrative laboratory control. The authors are strongly of the opinion, however, that the time is more than ripe for a radical revision of these standard procedures. . . . recent experience with new differential media has amply demonstrated the possibility of substituting for the inaccurate lactose presumptive test on the one hand, and for the tedious confirmed test on the other, a new presumptive test which shall be simple and yet quite accurate enough for all practical purposes. A test which, like the lactose broth fermentation, may give 90 per cent accuracy with one water and 50 per cent accuracy with another will not do; but a test which will uniformly reveal 90 per cent or more of the colon bacilli present is entirely adequate. There are many of the presumptive tests with inhibitive dyes which will yield results of such an order of accuracy and no sanitarian can interpret the results of bacteriological examination with any greater closeness than this. . . . The inertia of conservatism and the hypnotic effect of a false and delusive accuracy are the chief obstacles to progress in this field.

To all this the reviewer says Amen! The pioneer work in water bacteriology has been done. Nowhere, unless in court procedure, is it actually necessary to base interpretations upon the "complete" test for the colon group.

The laboratory, if it is to be a useful part of a water purification plant (and not a museum), must make every concession possible to speed and specificity. After all, one must recognize the fact that organisms of the sewage type eliminated by selective media, but demonstrated by lactose broth, are not the type that are likely to affect the consumer adversely. For no other purpose than that of producing a historical record in a classical manner can the present "complete" test be justified.

Fortunately the A.P.H.A.-A.W.W.A. committee has approved for inclusion in the next edition of Standard Methods one of the procedures developed for the use of inhibitive dyes. Let us all hope that it will be widely enough adopted to render the service of which it is capable. It is one of the steps so convincingly advocated by the authors of "Elements of Water Bacteriology."

A Country of Contrasts

PERU FROM THE AIR—By Lieut. George R. Johnson, Commanding Officer, 119th Photographic Section, 44th Division Aviation, New Jersey National Guard, Former Chief Photographer, Peruvian Naval Air Service; with text and notes by Raye R. Platt, Head, Department of Hispanic American Research, American Geographical Society. New York: American Geographical Society, Broadway at 156th St. Cloth; 11x10 in.; pp. 159; many halftones. $5.

FOR many reasons the republic of Peru, on the Pacific coast of South America, should be of more than academic interest to American engineers. Not only does it hold valuable mineral deposits, the mining of which is largely under American control, but by reason of its peculiar geography there is both need and opportunity for the extensive construction of irrigation works. American engineers are already active in this field, and there is every indication that, as Peruvian finances permit, the volume and complexity of the work will steadily increase.

Physically Peru is a desert on the sea. Its coast is so precipitous that there are almost no good harbors, and goods must be transferred from ship to shore by lighters. An arid plateau, devoid of vegetation, extends

from the bluffs along the coast to the foothills which merge into the main continental divide. Precipitation in this area is very slight, so that there are relatively few streams flowing westward to the sea. Community life and agriculture are limited to the floors of the valleys thus formed, and to the seaports which serve as gateways to them. East of the Andes the rainfall is less restricted, but communication over the mountains is so difficult that the development of this section has been greatly retarded.

All of this information, and much more, is conveyed vividly to the reader of Lieutenant Johnson's "Peru From the Air" by a large number of excellently reproduced serial photographs, in full-page size, supplemented by a few pages of explanatory text by Mr. Platt. Both of these men are to be congratulated upon their accomplishment. Even after the inevitable depreciation due to halftone reproduction, the illustrations are remarkable for their clarity and wealth of detail; while the text is written in a clear, succinct style which conveys much in a relatively small space. Perusal of the book leaves with the reader a mental picture of an unusual country which is second only to an actual visit.

Rigid-Frame Design on the Continent

REVIEWED BY E. G. PAULET

With Robinson & Steinman, Consulting Engineers, New York City

CALCUL DES CONSTRUCTIONS HYPERSTATIQUES: (Application d'une methode tres simple. Cadres et Portiques en Ciment Arme.) Par J. Rieger, Professeur a l'Ecole Polytechnique de Brno, Tchecoslovaquie, Paris, France: Dunod, 92 Rue Bonaparte (VI), Paper; 6½x10 in. Vol. I; pp. 168; 62 illustrations; 50 pp. of tables. Vol. II; 505 pp.; 390 illustrations and 107 pp. of tables. Price in France: Vol. I, 54 francs; Vol. II, 132 francs.

IN 1927, Prof. J. Rieger published in Czechoslovakia a method for the solution of statically indeterminate simple frames. The book was so well received that he followed it with a volume on the analysis of continuous frames. Both volumes have been translated into French and published at Paris as "Calcul des Constructions Hyperstatiques."

In his preface to Vol. I the author says that his treatise is based on a new generalized method, simple and easy of application. Beginning with Castigliano's theorem of least work, he arrives at the moment area method and generalizes it to apply to any type of statically indeterminate structure having rectilinear members. In this volume, the analysis of frames of various types—with two hinged ends, with one hinged and one fixed end and with two fixed ends—is covered in theory and in addition a complete design of a rigid frame for a concrete building is included that emphasizes the simplicity and practicability of the method. The text is followed by a set of formulas for different types of simple rigid frames subject to various loading conditions.

In the text of Vol. II, sixteen chapters are devoted to the analytic treatment of rigid continuous frames. These show in detail the application of the method given in Vol. I. Chapters I to XII treat two- and three-span rigid frames, incomplete or complete, hinged or fixed, and the influence of temperature is analyzed for these frames; also the continuous rigid frame of four spans is given consideration. Chapter XIII treats of rigid frames having one span and two or three stories.

A complete design is given for a rigid concrete-frame highway bridge of two spans and with columns hinged at the base, and a chapter is devoted to the analysis of the Vierendeel truss, quite extensively used in Europe and especially in Germany, and in Belgium, where it originated. The author has considered only the truss with parallel chords and gives a complete design for a 105-ft. span highway bridge. The Vierendeel truss with curved top or bottom chords or both could have been also analyzed, for that type lends itself better to architectural requirements, and in most cases would be resorted to.

Chapters XV and XVI give an analytic treatment that shows the influence of varying moment of inertia in members of rigid frames and also the influence of the deformation of the members due to direct forces upon the statically indeterminate types of continuous rigid frames subject to various loading conditions.

Municipal Expenses, Taxes and Debts

MUNICIPAL EXPENDITURES—By Mabel L. Walker, Ph.D. Baltimore: The Johns Hopkins Press. London: Humphrey Milford, Oxford University Press. Cloth; 6x9 in.; pp. 198; tables and line cuts. $2.25.

STATE AND LOCAL TAXATION OF PROPERTY—[Studies in Taxation and Public Finance] New York: National Industrial Conference Board, 247 Park Ave. Cloth; 6x9 in.; pp. 245. $2.50.

AN ECONOMIC ANALYSIS OF THE CONSTITUTIONAL RESTRICTIONS Upon Municipal Indebtedness in Illinois—By Ward L. Bishop, Assistant Professor of Economics, Lehigh University. [University of Illinois Studies in the Social Sciences.] Urbana: University of Illinois. Paper; 6x9 in.; pp. 113; tables and graphs. $1.

RESEARCH work on municipal expenditures and the taxes and bonds required to provide the money to foot the bills is on the increase. Such studies disclose faulty control of expenditures, ill-conceived and worse-administered methods of taxation, and futile attempts to set limits to municipal indebtedness. The three books now to be noted are, each in its way, distinct additions to research work in this municipal field.

Miss Walker's "Municipal Expenditures" is a commendable attempt to give a critical review of the main objects of municipal expenditure, set up a theory of expenditure, grade cities by services rendered, and correlate the ratings with the expenditures of the same city. In addition tendencies in and restraints on budget distribution are considered. The study is interesting and valuable, but the statistical portion, due largely to lack of basic data, is subject to considerable adverse criticism. Only two points can be noted: (1) The rating figures are based almost wholly on quantity of service rendered, with no weight given to quality and without consideration of unit cost. (2) An attempted correlation, city by city, of the author's ratings with the total of all general departmental expenditures is misleading, because the totals include departments not rated—notably waterworks, which for some reason not explained was not rated at all, either under "protection" or "public works."

"State and Local Taxation of Property" is a detailed and useful digest of constitutional and legislative provisions, under a number of well-considered heads, including kinds of property to be taxed, exemptions, percentage of full value at which property is supposed to be assessed, the several administrative methods, and local and state boards of review. All material is presented in tabular form, state by state. Some of the tables are supplemented by maps which show at a glance what rules or methods prevail in the various states. The tables are preceded by 90 pp. of well-put critical summary, which includes suggestions for reforms in law and practice.

The futility of most attempts to limit municipal debts by constitutional enactments is shown by Professor

Bishop's monograph on debt restrictions in the Illinois Constitution—a pioneer in this line—and the way they have worked in practice. Aside from such evasions as underassessment, Illinois has perhaps outdone other states in legislation authorizing the creation of special districts—school, sanitary and others—by means of which the constitutional debt limit has been multiplied several times. Some states have done better than Illinois in debt restriction, the monograph shows, but few if any have gone to the root of the matter; first in deciding how much should be attempted in the way of debt limitation, and next in devising a rational method of laying down and enforcing restrictions, taking into account size, wealth, and the social and industrial condition of cities.

Zoning Law for Laymen and Specialists

THE LAW OF ZONING—By James Matzenbaum, LL.B., of the Cleveland Bar. New York: Baker, Voorhis & Co. Cloth; 6x9 in.; pp. 569; $7.50.

THE interest and value of "The Law of Zoning" are increased by the fact that its author represented the village of Euclid, Ohio, in its successful defense of its zoning ordinance before the U. S. Supreme Court, resulting in the leading decision sustaining the constitutionality of zoning throughout the land. The book has been written, in large part, to stem the tide of correspondence on zoning in which the author has become involved. Consequently, it is phrased for the layman, though none the less useful to the specialist. It covers the origin and basis of zoning, reviews its progress, summarizes leading state and federal decisions, takes up boards of zoning appeals and other matters of practice, presents the standard zoning enabling act for the use of state legislatures, the New York, the Euclid and other municipal zoning ordinances and closes with the decision, in full, in the Euclid case. Detailed indexes, topical and by cases, are provided. For sheer interest, the author's "narrative" of the Euclid case, with its hours and days of suspense at critical periods, is notable. Engineers, city planners, lawyers and others concerned with zoning should welcome this book.

The Rigid Frame Applied to Bridges

THE RIGID-FRAME BRIDGE—By Arthur G. Hayden, M.Am.Soc.C.E., Designing Engineer, Westchester County Park Commission. With Chapters on Architectural Development by Gilmore D. Clarke, Fellow, A.S.L.A., and Deformeter Analysis by Prof. George E. Beggs, M.Am.Soc.C.E. New York: John Wiley & Sons. London: Chapman & Hall. Cloth; 6x9 in.; pp. 236; halftones, tables and line cuts. $4.50.

THE six or eight years since the first rigid-frame bridge was built in Westchester County, New York, has witnessed extensive development of this type of structure, particularly in Westchester County. Rigid-frame bridges had been used for many years in Europe, but Arthur G. Hayden was responsible for the pioneer designs in this country, and his book now sets forth the basic principles and methods as they have been refined from experience in building many concrete-frame bridges of 35- to 80-ft. span and several steel frame bridges of 80- to 120-ft. span. Briefly, the plan of the book is first to explain the principles upon which rigid-frame bridge design is predicated and then to present complete design calculations for six different types of structure, together with numerous practical suggestions for design and construction procedure. Prof. George E. Beggs contributes a chapter on the use of deformeter analysis, and Gilmore D. Clarke describes the architecture of short span bridges as it has been developed in Westchester County.

Beginning with the fundamentals of indeterminate analysis, Mr. Hayden develops deflection equations for the straight cantilever, the curved cantiler, the simple beam and the two-hinged arch, leading directly into the analysis of the symmetrical single-span rigid-frame bridge, which in effect consists of two curved cantilevers continuous at their junction. Expressions are developed for moments, reaction components and for angular, horizontal and vertical deflections. Methods of calculation are explained and the reader is ready for the detailed design data that follow. Complete designs, with all quantities arranged in tabular form, are given for a symmetrical single-span concrete-frame bridge with free ends; for the same structure with fixed ends; for an unsymmetrical single-span concrete-frame bridge with free ends; for a symmetrical single-span steel girder frame bridge with free ends; and for a double-span concrete bridge with hinged ends. An interesting and useful chapter is included on the theory and design of the skewed arch bridge in which the analysis is made in three mutually perpendicular planes.

Inherent economy and structural logic are widely claimed as advantages of continuous frame design. The data in this book are of such character and completeness that any engineer with sufficient curiosity can secure a good working knowledge of rigid-frame bridge design.

German Water-Works Handbook Revised

HANDBUCH DER WASSERVERSORGUNG—By Prof. Erwin Gross, München und Berlin: R. Oldenbourg. Cloth; 7x10 in.; pp. 485; 22 figures in the text. 22 marks.

THE second edition of Prof. Gross's German handbook on water supply is occasioned by the recent contribution to knowledge in the field of water-supply engineering, but it still gives the impression of touching only the most important topics. Since the topics considered are, naturally enough, chosen from the German viewpoint, the American reader is likely to find the book out of balance for his purposes. Among the additions to the earlier work are sections on the newer processes for improving potability of water, such as filtration through activated carbon, application of ammonia, and superchlorination, and a section on watershed protection. The scanty attention given to rapid filtration illustrates one of the notable differences between European and American water-supply practice.

New Local Government Unit Proposed

RURAL MUNICIPALITIES: A Sociological Study of Local Government in the United States—By Theodore Bergen Manny, Senior Agricultural Economist, United States Department of Agriculture, onetime Professor of Rural Sociology, Hendrix-Henderson College. New York and London: The Century Co. Cloth; 5x7¼ in.; pp. 343; line cuts and table. $2.

ALTHOUGH primarily concerned with rural communities, the author of this interesting and otherwise commendable book presents a plan for reorganizing all local government, from the county downward. Counties excluded for the moment, local government units would fall into four classes: (1 and 2) cities of the first and second class, with minimum populations of 100,000 and 10,000; (3) towns, minimum population of 2,000; (4) "incorporated rural municipalities," with at least 500 inhabitants and assessed property valuations of $500,000 or more. County activities would be restricted to state functions—reversion to their original status—and their form of government would be simplified and made more

efficient, more or less on the commission manager plan. There would be city-county consolidations for all cities of the first class—that is, these cities would take on such county functions as remain but for the city area only. For the towns under the new plan, little is said. For the "incorporated rural municipalities" a well-rounded and detailed statutory plan or enabling act is given, covering formation, organization, functions and financing methods, the latter including a zoning scheme to provide for expenditures to meet the need of more populous sections without undue burdens on the least populous and more wealthy areas.

The book is not confined to the plan thus briefly outlined. Its first half reviews the development of local government in this country, with a glance at "European backgrounds and contrasts," and considers in detail the deficiencies of American "local rural government" today. Results of a questionnaire on these deficiencies are presented in tabular form and discussed.

In considering the adequacy of the author's plan it should be remembered that his primary concern is to provide more satisfactory means than now exist to meet strictly rural community needs and that he feels that this cannot be done without readjustment of the whole range of local government. In planning this readjustment scant attention is given to the various classes of public works and services that are already being demanded and supplied in the rural and semi-rural districts and that are bound to improve in the near future. These sometimes extend through a large part of a county or even into two or more counties. Many counties are now providing public works and services of various kinds required by several lesser government areas within the county and the demand for intermunicipal works and services is increasing rapidly. If county functions are to be cut down, some other agency larger than the city, village, town or the proposed rural municipalities must be provided. This fact might well have been given consideration by the author, both in connection with his proposed incorporation of rural municipalities and his curtailment of county functions. Another suggestion is that in place of 2,000 and 10,000 as minimum populations for towns and second-class cities, 2,500 and 8,000 might be used, thus corresponding with the U. S. census urban population grouping, even though the lower of these figures applies to incorporated places.

It should be noted in conclusion that the author states that his plan needs further study. It is certainly a commendable beginning and deserves careful attention on the part of all who are interested in the welfare of a large percentage of our population and in local government, county, city and rural.

Surveying for Non-Civil Engineering Students

ELEMENTS OF SURVEYING—By Raymond E. Davis, M.S., C.E., Professor of Civil Engineering, University of California, Francis S. Foote, E.M., Professor of Railroad Engineering, University of California, W. H. Rayner, M.S., C.E., Assistant Professor of Surveying, University of Illinois. New York and London: McGraw-Hill Book Co. Flexible; 5x8 in.; pp. 581; tables and line cuts. $4.

BY ABRIDGEMENT of his "Surveying Theory and Practice," first published in 1928, Professor Davis has produced "Elements of Surveying" for short courses in surveying for non-civil engineering students. Although the more highly specialized branches of surveying have been eliminated and detailed discussions have been avoided, the work is a thorough and easily followed treatment of the primary operations of surveying. It is divided into four introductory chapters, a chapter on errors, twelve dealing with fundamental operations, including the use and adjustment of instruments, and seven on accepted practice on the more usual kinds of surveys.

New Books and Revised Editions

[Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.]

CHEMISTRY OF ENGINEERING MATERIALS—By Robert B. Leighou, M.S., Professor of Chemistry in the Carnegie Institute of Technology. New York and London: McGraw-Hill Book Co. Cloth; 6x9 in.; pp. 684; many illustrations. $4.50.

A second revision of a book originally published as "Chemistry of the Machine and Building Industries"; reviewed in these columns June 21, 1917, p. 633. Changes in the first revision were noted briefly June 18, 1925, p. 1030. In the present edition, the chapter on non-ferrous metals has been enlarged by adding magnesium and cadmium and inserting more photomicrographs and thermal diagrams; iron corrosion has been extended to include material on primary oxide films; the chapter on foundry sands has been entirely rewritten and a section on high-early-strength cements has been added; and various other sections have been revised.

CITY MANAGER YEARBOOK—Paper and Addresses of the Seventeenth Annual Convention the International City Managers' Association Held at San Francisco, Calif., Sept. 24 to 27, 1930. Chicago, Ill.: The International City Managers' Association, 923 East 60th St. Cloth; 6x9 in.; pp. 305; $2.

Besides papers on many phases of municipal government and proceedings of the association named, contains an Official Directory of Council-Managers, Cities and City Managers as of Jan. 1, 1931, and a less detailed directory of "unofficial" council-manager cities.

THE ECONOMICS OF RATE MAKING—By Nicholas S. Hill, Jr. Address before Pennsylvania Water Works Association at Atlantic City, N. J., Oct. 23, 1930. Paper; 6x9 in.; pp. 21. Address the author, 112 East Nineteenth St., New York City.

FLOW OF LIQUIDS IN PIPES OF CIRCULAR AND ANNULAR CROSS-SECTIONS—By Alonzo P. Kratz, Horace J. Macintire, Richard E. Gould. Urbana, Ill.: University of Illinois. Paper; 6x9 in.; pp. 28; line cuts and tables. 15c.

GEOLOGIC HISTORY OF THE YOSEMITE VALLEY—By Francois E. Matthes. Professional Paper 160, U. S. Geological Survey. Paper; 9x11 in.; pp. 137; colored and other maps and many halftones. $1.10 from Superintendent of Documents, Washington, D. C.

A handsomely illustrated description of one of the most interesting of the natural parks of the United States.

MUNICIPAL SCHOOL AND UNIVERSITY STADIA—By Randolph O. Huus, Professor of Political Science, Friends University, Wichita, Kan., and Dorothy I. Cline, Former Field Secretary, Cleveland League of Women Voters and Citizens Union, Kansas City, Mo. Publication No. 18. Municipal Administration Service, 261 Broadway, New York City. Paper; 7x10 in.; pp. 33; many tables. 35c.

Contains physical, financial and other data on 117 of the 141 stadia in the United States, besides an extensive bibliography.

PROPERTIES AND MECHANICS OF MATERIALS—By Philip Gustave Laurson, M.S., Associate Professor, M.Am.Soc.C.E., and William Junkin Cox, C.E., Assoc.M.Am.Soc.C.E., Assistant Professor of Engineering Mechanics, Sheffield Scientific School of Yale University. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6x9 in.; pp. 353; tables and graphs. $3.50.

RECOMMENDED MINIMUM REQUIREMENTS FOR FIRE RESISTANCE IN BUILDINGS—Report of the Department of Commerce Building Code Committee; William K. Hatt, Chairman. Paper; 6x9 in.; pp. 58; many illustrations. 10c. from Superintendent of Documents, Washington, D. C.

SUMMARY OF IRRIGATION-DISTRICT STATUTES OF WESTERN STATES—By Wells A. Hutchins, Irrigation Economist, Division of Agricultural Engineering, Bureau of Public Roads. Paper; 6x9 in.; pp. 126. 20c. from Superintendent of Documents, Washington, D. C.

TENTATIVE METHODS OF PROCEDURE FOR INSPECTION OF MATERIALS—Compiled by National Engineering Inspection Association, P. O. Box 1119, Pittsburgh, Pa. Paper; 5x8 in.; pp. 30. Free on application.

TRUE ECONOMY IN HIGHWAY BRIDGE DESIGN—By T. W. Dodd, President, St. Joseph Structural Steel Co., Discussion by J. E. Greiner, Consulting Engineer. New York and Cleveland: American Institute of Steel Construction, Inc. Paper; 8x10 in.; pp. 47; photographs and line cuts. Free on application to American Institute of Steel Construction, 200 Madison Ave., New York City.

UNION-MANAGEMENT COOPERATION ON THE RAILROADS—By Louis Aubrey Wood, Associate Professor of Economics in the University of Oregon. New Haven: Yale University Press. London: Humphrey Milford, Oxford University Press. Cloth; 6x9 in.; pp. 326; $4.

Deals with the subject indicated chiefly as applied to the maintenance of mechanical equipment.

THE X-RAY METHOD APPLIED TO A STUDY OF THE CONSTITUTION OF PORTLAND CEMENT—By L. T. Brownmiller, R. H. Bogue, U. S. Bureau of Standards. Reprint from Bureau of Standards Journal of Research, Vol. V, October, 1930. Paper; 6x9 in.; pp. 17. Many illustrations and tables. 10c. from Superintendent of Documents, Washington, D. C.

LETTERS TO THE EDITOR

A Forum for Expression of Views by Engineers and Contractors

✦

Sydney Harbor Arch Erected in 22 Months

Sir—We have read with interest the excellent articles appearing in *Engineering News-Record*, Oct. 23, in regard to the erection of the Kill van Kull arch and the Sydney Harbor arch, the latter being a contract which is being carried out by our company. The comparative data relating to the respective arches given on p. 645 will form an excellent record, but we desire to point out an error in regard to the date of commencement of the erection of the arch of the Sydney Harbor Bridge. In your statement this is given as January, 1925, which is the date we commenced work on the excavations and foundations for the ten approach spans.

After January, 1925, it was necessary to import, erect and equip bridge fabricating shops; equip a granite quarry to supply crushed granite for aggregate and dimension stone for architectural features; and to complete the erection of piers and steelwork for the approach spans. All this work had to be carried out before we could commence the erection of the arch.

Actually, the first sections of steel in the arch were erected on the following dates: on south shore, Oct. 26, 1928; on north shore, July 22, 1929; the closure of the arch being effected on Aug. 19, 1930.

In connection with the contract we have excavated 36,000 cu.yd. of earth, 102,000 cu.yd. of rock and have deposited some 125,000 cu.yd. of concrete. The granite dimension stone for the architectural features totals more than 20,000 cu.yd.

All of the work in connection with the complete contract has been carried out by the one staff, engaged by our company, and a very considerable proportion of the steel in the approach spans and the main span was rolled in our English mills. There were no sectional subcontracts or subcontractors in connection with the contract for the complete structure.

L. ENNIS,
Director of Construction,
Sydney Harbor Bridge.
Dorman, Long & Co., Ltd.,
(Bridge Department)

Sydney, N.S.W.,
Dec. 8, 1930.

Coefficients for Large Venturi Meters

Sir—The following comments refer to the article in *Engineering News-Record*, Jan. 29, 1931, p. 185: "Determining Coefficients for Large Venturi Meters," by S. F. Coghlan.

After looking over the data carefully one is impressed with the statement regarding the accuracy of the salt velocity method used in calibrating the Venturi tube. It is readily admitted that this method does give "consistency" and is reasonably accurate when made under favorable conditions. However, it would appear that if the salt velocity method is not over ½ of 1 per cent in error in these tests, the proof of this assertion is many times more interesting to the engineer than the numerical value of C, given in the charts.

Anyone who will consider carefully the data furnished will readily observe that the salt velocity method has been accepted as 100 per cent perfect, and all errors charged to the Venturis. The variation of C, which is the difference between the theoretical calculation and the value of C as found in the tests, has a range from about 0.95½ to 1.00, or 4½ per cent in penstocks 1 to 14. It is stated that these Venturi tubes were made in accordance with good practice and were installed in favorable locations. The remaining Venturi tubes have a C range from .87 to .99½, but with less favorable locations. Nevertheless, they are all made to assume the burden of all errors in calibration.

The student of the Venturi tube can claim, with some degree of justification, that he wants no better evidence than the data furnished to convince him that the error lies principally in the salt velocity method and not in the tube. The fact that tubes 1 and 5 for example, are almost identical, yet have coefficients of 0.95½ and 1.00, runs contrary to the general theory that similar tubes and installations should give similar results.

One point to be emphasized is that in hydraulic measurements, where current meter, Venturi, orifice plate, weir and pitot are used, the results are only approximate. An error is often made in referring to the "degree of accuracy," when "consistency" is the proper word. Any one of the above methods often shows a consistency of 1 per cent, but there is no assurance of an error with a limit of 1 per cent, except under very unusual conditions. It would add greatly to the knowledge of the engineer in work of this character to introduce a second method as a check measurement and try to account for any unusual results. Particularly in this calibration work the comparison of the salt velocity method and the Venturi could have been supplemented by measurements with the pitot tube.

If this information had been obtained and the results compared to the Venturi and salt velocity methods, there would have been some assurance that the difference between the theoretical and actual coefficient C, as given, was not due in part to some inaccuracy of the salt velocity method. As a matter of fact, a pitot tube installation could have been provided in the various penstocks, which would have been more accurate than the Venturi records here indicate, and at a small fraction of the cost.

One cannot study this data without observing the consistency shown by the two methods. The fact that the C curves nearly all lie within the range of 1 per cent from high to low velocity indicates a high degree of consistency in taking the readings of the two methods. On the other hand, the 4½ per cent range in group A, the 4 per cent range in group B, and the range of 12 per cent in group C, for the coefficient C, leads one to question seriously the justification for assuming the extreme accuracy of the calibration method. As the data now stands, there is no way to substantiate the statement regarding the accuracy of the salt velocity or to justify the numerical value of C as given.

ARTHUR L. COLLINS.

Berkeley, Calif.,
Feb. 7, 1931.

Silvan Dam Corewall

Sir—C. H. Howell, in his article in the issue of Feb. 26 on the subject "Cellular Corewalls for Embankment Dams," makes the statement that so far as he knows, this type is a new development.

It may interest Mr. Howell and other readers to note that the corewall of the dam for the Silvan Reservoir of the Melbourne, Australia, water-works is built with a cellular corewall. This dam is illustrated on p. 116 of your Jan. 15, 1931, issue, and the cells in the downstream face of the dam are briefly described there.

The placing of the cells in the Silvan Dam is a development from the system of drainage arranged for the downstream face of the Hume Dam, across the Murray River in Australia. A section of this dam is illustrated on p. 115. The failure of the Eildon Dam (weir) in Australia, together with the outstanding advantages of the cellular construction, resulted in the adoption of the illustrated design for the Silvan Dam. I believe the Australian engineers do not claim to have discovered the idea but to have obtained it from some other source or inspiration.

The circular cells in the Silvan Dam would seem to be easier to construct and to give greater strength than the oblong cells shown in the dam for the Conchos irrigation project described by Mr. Howell.

H. E. BABBITT,
College of Engineering,
University of Illinois.

Urbana, Ill.,
Feb. 28, 1931.

Zoning Law Correction

Sir—In reading over an article by myself, entitled "New Zoning Law for Los Angeles," on p. 891 of the Dec. 4, 1930, issue, I find a typographical error in the third paragraph on p. 892. The sentence states, "The R_1 zone is practically the same . . . " This should read, "The R_4 zone is practically the same. . . ."

DONALD M. BAKER.

Los Angeles, Calif.,
Dec. 24, 1930.

NEWS OF THE WEEK

Bids on Wards Island Sewage Plant Reflect Drop in Costs

Final tabulation of the eighteen bids opened on March 9 by the New York City department of sanitation for the construction of a part of the Wards Island sewage-disposal plant are now available to supplement the preliminary figures given last week, p. 455. W. H. Gahagan, Inc., 147 Remsen St., Brooklyn, was low with a bid of $3,867,780. Second low was $4,561,732, submitted by the Federal Construction Corp., of New York City. There were seven other estimates between the latter figure and $5,000,000, while the high bid (Silas Mason Co., Inc., New York City) was $6,028,774. The engineer's estimate, prepared by Fuller & McClintock for the purpose of securing an appropriation for the work and based upon prices prevalent two years ago, was $6,172,309. The city expects to award the contract as soon as an investigation of the financial responsibility of the low bidder has been completed.

The contract covers the construction of preliminary and final settling tanks, aeration tanks, substructures for operating galleries, preliminary and return sludge pumping stations and foundations for sludge storage and decantation tanks, as well as appurtenant pipes, conduits, drains and other accessories. Quantities include approximately 406,000 cu.yd. of earth excavation, 55,000 cu.yd. of rock excavation, 113,000 cu.yd. of concrete, 7,000 tons of reinforcing steel, 3,600 tons of cast-iron pipe and 55,000 lin.ft. of screwed pipe in 4-in. and smaller sizes.

New Orleans Paving Costs Under Investigation

The cost of street paving in New Orleans, which has not dropped in price in spite of the lowering costs of material and labor, is being studied by New Orleans property holders. The investigation will also cover a study of the laws which regulate the letting of paving contracts; why only two contractors have been the successful bidders for the last few years, and what part if any politics has played in awarding contracts.

New York Firm Lowest Bidder on East Boston Tunnel

Only five concerns submitted bids on March 4 for the contract to build the major section of the $16,000,000 East Boston (Mass.) tunnel. Silas Mason Co., Inc., of New York, was the lowest bidder, at $5,696,510. The highest bidder was Colman Bros., Inc., of Boston, at $9,424,602.50.

Prequalification for Public Works Bidders Is Passed in Oregon

A BILL providing for the prequalification of prospective bidders on public work has passed the Oregon state legislature and been signed by the governor. This bill received the sponsorship of the local chapter of the Associated General Contractors and other organizations and is acceptable to contractors generally.

The bill provides that for all contracts for public improvement to cost over $10,000 by the state or any of its subdivisions the public officer responsible for receiving bids shall require prospective bidders to submit a statement as to their financial ability, equipment and experience before delivering the bid proposals. On the basis of such statement and any further investigation the public officer may desire to make, he may disqualify prospective bidders, who are then given 24 hours to appeal to the board of appeals having jurisdiction over the work in contemplation. These boards provided for in the act consist of state, county and city officers, depending on whether the work is state, county or city work.

San Gabriel Construction Camp to Be Rehabilitated

Rehabilitation of the San Gabriel Canyon forks site construction camp, unoccupied since a year ago, when work on Los Angeles County's high dam at the location was abandoned, has been ordered by the Los Angeles county board of supervisors to provide headquarters for engineers engaged in exploration of three dam sites higher in the canyon. The camp was built to house 500 men.

Dan McFarland will be the resident engineer for the new work, which includes construction of three low dams and spreading grounds in accordance with flood-control plans of E. C. Eaton, Los Angeles county flood-control district chief engineer. Mr. McFarland at one time was on the staff of consulting engineers of the British government on hydro-electric development in South Africa and later became a resident engineer on the state engineer's staff in California.

Los Angeles to Vote Again on Sewer Bond Issue

The Los Angeles city council has voted to submit a $6,000,000 bond issue proposal to voters at the primary election in May for the construction of sanitary sewers. The same issue was on the ballot last November and failed of passage by a small margin.

A $5,000,000 bond issue to be expended in city improvements as relief for the city's unemployed was approved at a special election March. 5. Three propositions were on the ballot. One authorized the issuance of $3,000,000 bonds for construction, reconstruction, maintenance and repair of streets. The second authorized $1,000,000 bonds for public park improvements and the third provided $1,000,000 for playground improvement.

San Gabriel Canyon construction camp

Opportunities for Engineers in Russia to Be Studied

A study of the opportunities for American engineers in Russia and the conditions in that country will be made by a committee of the American Society of Civil Engineers consisting of Philip W. Henry, chairman; George H. Pegram, George W. Kittredge, John R. Slattery and R. W. Hebard. It is not the intention of the committee to send any of its members to Russia, but information will be sought from engineers who have engaged in work in that country and returned here. It is expected that the committee will be able to make at least a preliminary report to the board of direction at its meeting in Norfolk, Va., in April.

Opening of New York Bridges to Be Ahead of Schedule

The date for opening the new Hudson River bridge and the Kill van Kull bridge to traffic was brought forward to the latter part of 1931 in the annual report of the Port of New York Authority submitted to the governors and legislatures of New York and New Jersey on March 3. This is many months in advance of the schedule on both structures. The earliest time heretofore mentioned for their completion was the early part of 1932.

Governor Roosevelt, of New York, has signed the bill outlined in *Engineering News-Record* March 5, vesting the control and operation of the Holland tunnel and various bridges in New York in the Port Authority and authorizing the Authority to construct an additional vehicular tunnel to New Jersey. The specifications for this tunnel are being prepared, it is announced, and the Port Authority expects to advertise for bids in August.

Seattle Agitated by Removal of City Light Superintendent

J. D. Ross, superintendent of municipal light in Seattle, Wash., for the past twenty years, has been removed from office by Mayor Frank Edwards, who twice reappointed him to the post. The mayor's action was taken on the eve of the city election, at which the voters of Seattle passed, with a majority of 2,000 votes, a measure proposed and fathered by Mr. Ross, which provides that all engineering work for the city light department be placed under city light supervision instead of in the hands of the city engineer, as at present. This measure was strongly opposed by the mayor and Oliver T. Erickson, president of the city council. Erickson, who was up for reelection, was defeated, as were other candidates who had attacked city light.

Charges preferred against Ross by the mayor are that "he has been inefficient and disloyal to the city's best interests, extravagant and wasteful in the matter of public funds and has failed to cooperate with the city council, board of public works and the mayor." Also that he failed to provide suitable right-of-way for transmission lines to the Skagit power plant.

The mayor's appointment of Armand F. Marion, chief engineer of the Pacific Coast Co., to the vacant post was submitted to the city council, which passed a vote of confidence in Ross, refused to act upon the nomination and referred to a committee for formal consideration a demand by the Municipal Protective League for the impeachment of the mayor.

Lewis W. Baldwin Elected President, A.R.E.A.

Lewis W. Baldwin, president of the Missouri Pacific Lines, who has been

Lewis W. Baldwin

elected president of the American Railway Engineering Association for 1931-32, is a railway engineer-executive officer, having been in both the engineering and operating departments for 35 years. Mr. Baldwin was born at Waterbury, Md.; in 1893 he was graduated from St. John's College, Annapolis, Md., and in 1896 from Lehigh University with a degree in civil engineering. In 1896 he entered the engineering department of the Illinois Central R.R. and after becoming successively superintendent, engineer of maintenance-of-way and general superintendent of that road and the Yazoo & Mississippi affiliated line, was made general manager and vice-president of the Central of Georgia Ry. in 1915. During 1918-19 he was assistant regional director and then regional director of the U. S. Railroad Administration, but in 1920 he returned to the Illinois Central R.R. as vice-president in charge of operation, where he remained until his appointment as president of the Missouri Pacific in 1923. Besides his membership in the American Railway Engineering Association, Mr. Baldwin is a member of the American Society of Civil Engineers and the American Railway Association.

Philadelphia Resumes Work on Subway After Two-Year Delay

Construction work was ordered resumed last week on the new Market St. subway line under City Hall, Philadelphia, after two delays of nearly a year each had held up the project since the contract award in April, 1929. Suit by a disqualified low bidder took nearly a year to settle, but the contract award to the second low bidder, the Underpinning & Foundation Co., Inc., was upheld. The project involves the construction of a new double-track line passing directly under the old city hall to replace two single-track lines now looping around the building. A dispute, commencing early last year, between the contractor and the department of city transit as to methods to be used in underpinning the city hall was finally referred to a board of arbitration last fall. The board, consisting of Percival M. Sax, consulting engineer, appointed by Transit Director C. E. Myers; Daniel L. Turner, consulting engineer, New York, representing the contractor, and Henry E. Ehlers, elected by the two others, decided in favor of the contractor. The transit department has accepted the board's ruling and has ordered the contractor to resume work, though the change in underpinning methods is estimated to cost $200,000 more than the original contract.

New McClintic-Marshall Appointees

Announcement of additional new appointees in the McClintic-Marshall Corp. (subsidiary of the Bethlehem Steel Corp.) has been made as follows:

H. R. Walters becomes assistant to the president; John N. Marshall, assistant to the vice-president in charge of operations; Jonathan Jones, chief engineer; C. H. Mercer, consulting engineer; and C. A. Johnson, manager of sales.

Mr. Marshall and Mr. Jones are continuing in the capacities which they held with McClintic-Marshall under the previous régime. Mr. Walters was formerly manager of the fabrication and erection department of Bethlehem Steel. Mr. Mercer was chief engineer in that department, and Mr. Johnson was manager of sales of fabricated material.

Clausen Gold Medal Awarded to J. A. L. Waddell

At a dinner in the Hotel Astor, New York City, on March 11 the first award of the Clausen gold medal was made to John A. L. Waddell "for distinguished service for the welfare of engineers, social and economic." David B. Steinman was toastmaster and the keynote of the dinner was "to emphasize economic, ethical and professional relations of engineers." The Clausen medal was established by the American Association of Engineers and will be awarded annually.

Indiana to Regulate Dimensions and Weights of Trucks

A bill regulating the height, weight and length of trucks has been passed by the Indiana legislature and the signature of the governor is looked for because stringent limits on motor trucks were recommended by him in his message to the legislature. The bill provides that trucks shall be not more than 8 ft. wide and 12 ft. high. The length of a single vehicle is limited to 33 ft. and combination vehicles coupled together shall not be more than 40 ft. long. The axle weight on pneumatic tires shall not be more than 16,000 lb. and on solid tires 80 per cent of the weight on pneumatic tires. The bill, if signed, will become effective on Jan. 1, 1932. It was bitterly fought by the Motor Truck Association of Indiana and by many industries.

Seek Injunction Against Use of St. Petersburg's Pier

Injunction proceedings to prevent further use of the concrete pier at St. Petersburg, Fla., pending a hearing on a damage suit for alleged violation of patent rights in building the structure have been started in the federal court in Tampa. The request for an injunction followed filing of damage suits by the Dock & Terminal Engineering Co. and others against the city of St. Petersburg, the city of Tampa and the Tampa Union Terminal Co. for alleged infringement on the patent for reinforced concrete awarded to William S. Ferguson, Cleveland, in 1909. The recreation pier was constructed by the Raymond Concrete Pile Co. at a contract price of $681,550. Work was started late in 1925 and the pier was formally opened on Nov. 25, 1926.

Bids Opened for Construction of Mount Vernon Boulevard

Bids for the construction of the Mount Vernon Boulevard were opened on Feb. 26 by the U. S. Bureau of Public Roads. There were 47 offers, and the bureau indicated that awards may not be made for several weeks.

For section 1 of the project, the 7.567-mile strip of highway from Columbia Island to the southern end of the hydraulic fill over Hunting Creek, a short distance south of Alexandria, the lowest bid was $605,619.25, by the MacDougal Construction Co., of Atlanta, Ga. The Roberts Paving Co., of Salisbury, Md., made the lowest bid, $557,440.20, for the construction of section 2, the 7.794-mile strip from Hunting Creek to Mount Vernon.

The highest bid for the entire project was $1,658,569.85. Twelve bids were submitted for construction of the entire project in a single unit, fifteen for the separate construction of the first section and twenty for the second section.

Hoover Dam Notes

Ten proposals for supplying cement for use in the Hoover Dam project were opened in Denver on Feb. 19. The contract, which was for supplying 20,000 bbl., was awarded to the Monolith Portland Cement Co., of Los Angeles, whose bid was $1.50 per barrel, net, or $30,000, less 40c. per barrel for sacks returned. The government must pay freight charges from Monolith, Calif., to the dam site.

The Union Pacific branch line is completed to Boulder City and freight is going in over it. Machinery and materials are arriving for the construction of the government railway line to the dam site. Work on the automobile highway has started. The ground plan of

W. A. Bechtel

the town is being laid down, and work will be started soon on the administration building, the clubhouse and several of the larger residences. Water-supply tanks are being set up, pumping machinery is being bought and preparations are being made for lifting a water supply from the river and purifying it.

The Southern Sierras Power Co. has announced that power will be available at the dam site on June 1, 24 days ahead of contract delivery date. As little actual construction work can be done until power is available, earlier completion of the power contract means that construction operations can be started three weeks ahead of the schedule as originally made.

Secretary of the Interior Wilbur has issued a warning to those who may be thinking of looking for jobs on the project. The town of Las Vegas, the nearest settlement to the dam, has reported that 10,000 job seekers have already presented themselves. This is many times the number that can ever find employment.

A. E. Cahlan writes further in the Las Vegas *Review-Journal* on the employment situation:

"Never, in all the months of discussion of the unemployment situation, has it been revealed in all its awful reality as during the past two days in discussion with Frank T. Crowe, construction superintendent for the Six Companies, Inc. The echo of Chief Engineer Walter's voice had scarcely died away after announcing the low bid before everybody with any official connection with the successful concern was being bombarded from all sides with letters, telegrams and telephone calls from job hunters from the four corners of the United States. Only a couple of hours elapsed before every one of these officials was forced to request the hotel to taboo telephone calls to their rooms, and that only partly solved the difficulty.

"Today each one of these officials is deluged with mail, bushel baskets before breakfast, bushel baskets with every incoming mail train. Phone calls at all hours of the day and night come from all over the country. Now that Crowe is definitely located at Las Vegas, he has to fight his way through the crowds waiting to interview him—all believing that if they can get there first they will surely get the coveted job. They gather at his hotel before breakfast; they await his return to his room from his office. They get him out of bed at 3 o'clock in the morning—and, well, you can draw the rest of the story yourself."

W. A. Bechtel, first vice-president of the Six Companies, Inc., contractor on the Hoover Dam, will be the nominal head of the firm during the illness of W. H. Wattis, president. Other officials of the Six Companies, Inc., are E. O. Wattis, second vice-president; Felix Kahn, secretary; and Frank T. Crowe, general manager.

Walker R. Young, construction engineer in charge of the project, announced that Boulder City will be ready for occupancy in the late summer or early fall, probably about Oct. 1. No leases for business locations in this community will be granted before that time.

N. Y. Sewage Works Association Meets in Albany

The third annual meeting of the New York State Sewage Works Association was held in Albany, N. Y., on March 5, with 80 members and guests registered. At the morning session Lawrence Luther gave a paper describing the construction and operation of the sewerage system and sewage-treatment works at Freeport, L. I. The afternoon was devoted to a symposium on sludge, E. F. O'Brien, of Syracuse, opening the discussion on "Collection and Digestion," followed by a discussion by W. B. Corwin, of Larchmont. W. A. Ryan, of Rochester, presented a paper on "Drying and Disposal," which was followed by a discussion by Morris Cohn, of Schenectady, and G. E. Willcomb, of Albany.

John F. Skinner, of Rochester, was elected president, E. B. Phelps, of New York City, vice-president and A. S. Bedell, of Albany, secretary-treasurer. The next meeting will be held in Freeport, on June 5-6.

Chief of Engineers Recommends Lock for Cape Cod Canal

The secretary of war transmitted to Congress shortly before the close of the session the report of the Chief of Engineers on the preliminary examination and survey of the Cape Cod Canal. The report recommends a modification of the existing project to provide a lock canal with one lock instead of the present sea level canal. The lock is to be 110 ft. wide and 1,000 ft. in usable length with 40 ft. over the sills. The depths in the canal and approaches will be 30 ft. with a width of 250 ft. in the land cut, a width through Buzzards Bay of 400 ft. to Wings Neck in a new straight alignment and of 700 ft. beyond Wings Neck. The report also recommends a highway bridge of adequate vertical clearances, a suitable railroad crossing and a 15-ft. channel into Onset Bay.

Emergency Fund to Spur Work by U. S. Reclamation Bureau

Allotment by Congress of a $5,000,000 emergency fund to the U. S. Reclamation Bureau will permit work to proceed on many contemplated projects which have been held in abeyance because the bureau was unable to finance them. Among these are: the project on Bully Creek, Ore., approximating in cost $150,000; the pipe line to carry water to the orchards in the Kennewick division of the Yakima project, Washington, amounting to $100,000; the Baker project, Oregon, $200,000; the $300,000 Utah project involving Cache Valley in the Salt Lake Basin.

Elwood Mead, commissioner of reclamation, announces that bids on a $3,500,000 dam and reservoir in the Yakima project will be called for in May.

War Department Allots Funds for River and Harbor Work

Upon recommendation of the Chief of Engineers, the secretary of war has made allotments to works of river and harbor improvement totaling $52,819,245.75. This total is made up of $50,696,111.97 from the $60,000,000 provided in the war department appropriation act approved Feb. 23, 1931, and the entire available balances of the act of May 28, 1930, and of the $22,500,000 emergency appropriation for relief of unemployment. Among the allotments are the following: Delaware River, Philadelphia to the sea, $1,691,600; Ohio River, open channel work, $2,098,000, and lock and dam construction, $230,000; Kanawha River, W. Va., $1,300,000; Mississippi River between Illinois and Wisconsin rivers, $1,812,000; Mississippi River between Wisconsin River and Minneapolis, $2,120,000; Missouri River, Kansas City to the mouth, $6,149,800, and Kansas City to Sioux City, $910,000; Illinois River, $2,328,300; St. Marys River, Mich., $1,372,000; Oswego Harbor, N. Y., $1,012,000.

Fellow Engineers Honor Youthful Septuagenarian

Some 80 engineers of New York, Boston, Pittsburgh and elsewhere gathered on March 12 at dinner in the Hotel Astor, New York, to celebrate the 70th birthday of J. Waldo Smith, builder of the Catskill aqueduct and since 1922 consulting engineer of the board of water supply of New York City. Members of the board as well as other present and former officials of the city joined in the celebration. Thaddeus Merriman, Mr. Smith's successor in the position of chief engineer of the board, presided as toastmaster. Mr. Smith in his characteristic way was more youthful and active than his hosts, few of whom reached his age. He had become 70 on March 9, but the occasion did not suffer through the lapse of three days.

J. Waldo Smith

Among the speakers were the 91-year-old Charles A. Shaw, one of the original members of the board; Robert Ridgway, former division engineer on the aqueduct and now chief engineer of the board of transportation; George J. Gillespie, chairman of the board of water supply; George S. Davison; Prof. William H. Burr, member of the famous Burr-Hering-Freeman board, whose report preceded construction of the Catskill reservoirs and aqueduct; Morris Sherrerd, consulting engineer to Newark and closely associated with Mr. Smith in his New Jersey work, preceding the Catskill undertaking; George McAneny, former member of the city's board of estimate and apportionment; and John Cook, of Paterson, long a leader in the East Jersey Water Co. and its successors.

Mr. Shaw recalled the remarkable political cooperation between opposite parties controlling city and state governments that created the original board; the aqueduct work throughout, he said, was carried out in the spirit of that appointment. Mr. Ridgway described Mr. Smith as a man of "cheerful yesterdays and confident tomorrows."

Mr. Sherrerd, after telling something of the New Jersey period of Mr. Smith's career, remarked that in the early part of the Catskill work he had thought that excessive amounts were being spent on preliminary work, but later learned better, recognizing the imperative need for these advance studies. Mr. McAneny recalled the days of 40 years ago, when, as a writer for *Harper's Weekly* under Richard Harding Davis, he was sent to write up the new water supply of Newark, built under direction of Clemens Herschel, "the greatest hydraulic engineer," and there met Mr. Smith.

In acknowledging the several spoken tributes, Mr. Smith remarked that when the final engineering plan for the Catskill system was completed, late in 1905, the city's water-supply situation was much like the present one, with consumption close to the capacity of the supply and extension urgently needed. On the subject of the success of the Catskill organization, which had been remarked upon by most of the speakers, he recalled that he had the steadfast support of the city officials and of the board in building the organization on the basis of merit, efficiency and personality. "When merit and fitness are disregarded and favoritism comes in," Mr. Smith concluded, "such an organization is sure to go down."

Staggered Closing Hour Plan Proposed in San Francisco

To relieve the congestion of peak rush hours, a stagger plan, the result of a two-year study by the traffic survey committee, has been recommended by the Junior Chamber of Commerce of San Francisco. It is proposed that non-retail establishments begin and end work half an hour earlier, thus allowing 32,000 workers to be well on their way home in the afternoon before the retail workers stop work. Business houses are being canvassed and if the plan is acceptable it is hoped to put it into effect May 15.

Baltimore Engineers Oppose Registration

Members of the various engineering societies of Baltimore, at a recent meeting held at the Engineers' Club, decided to oppose passage by the Maryland general assembly, now in session, of legislation requiring registration or licensing of engineers and land surveyors. It has been stated that such a bill will be introduced. The meeting was attended by representatives of the Baltimore sections of the American Institute of Electrical Engineers, Civil Engineers, Mechanical Engineers, Baltimore Chapter, Illuminating Engineering Society; and the Maryland sections of the American Chemical Society and the American Institute of Chemical Engineers.

Metropolitan Water District Adopts Delivery Policy

Directors of the Metropolitan Water District of Southern California have announced adoption of a policy which assures each city now in the district the delivery of Colorado River water at a point usable by each city, through a feeder system provided by the district. It is contemplated that the feeder system will be paid for by the district and financed out of the proposed district bond issue.

Portland, Ore., to Investigate Plans for Municipal Power

By a vote of three to two, the city council of Portland, Ore., the mayor and one commissioner dissenting, has adopted an ordinance providing for a contract with Carey & Harlan, consulting engineers, for an investigation of the possibilities of a municipal power system for the city. The fee for the investigation is $25,000, of which $20,000 will have to be paid before the investigation is completed and the final report accepted by the city.

The contract calls for investigation of several specific sites on the Columbia and Deschutes rivers (without borings) and estimates of cost of development, of transmission lines, of substations and of present and prospective distribution systems in the city, and includes a study of the market and possible rates for power. Leading engineers who have examined the contract declare it cannot be complied with fully for $25,000.

St. Paul Federal Building Plans Take Concrete Form

Plans for the new federal building and post office in St. Paul, Minn., have taken concrete form by the selection by the U. S. treasury department of Lambert Bassindale as architect to design the building and the retention of Holabird & Root, of Chicago, as consulting architects. The building, 150x300 ft., will be situated on the Third St. esplanade across the street from the union depot. For its construction $2,700,000 has been appropriated, $600,000 of which is to be expended in absorbing the present commercial postal station and other leases. The building will be four blocks east of the new $4,000,000 city and county building.

Flood Prevention in England

Work has recently been commenced in London, England, on a $3,650,000 project for improvement of the channels of the River Lee in the Stratford district to relieve flooding in the borough of West Ham and adjacent districts and aid navigation of certain of the back rivers. Where necessary, existing streams will be cleared and widened, and additional flumes and a bypass channel are to be constructed.

Tunnel Under City of Quebec Making Good Progress

The new tunnel which the Canadian Pacific Railway is driving under the highlands at Quebec to reach the new steamship terminal in Wolfe's Cove was holed through recently. The tunnel is to be 5,288 ft. long, 16 ft. wide and 22 ft. 6 in. high. Driving has been carried on from the two portals.

The tunnel will give the Canadian Pacific Railway access to the piers of the new steamship terminal now served only by the Canadian National Railways. Work on the Canadian Pacific tunnel is being pushed in order to have it completed by June, when the steamship "Empress of Britain" will make its maiden voyage to Canada. The new terminal is designed to serve large vessels that cannot be accommodated at the existing steamship terminals at Quebec.

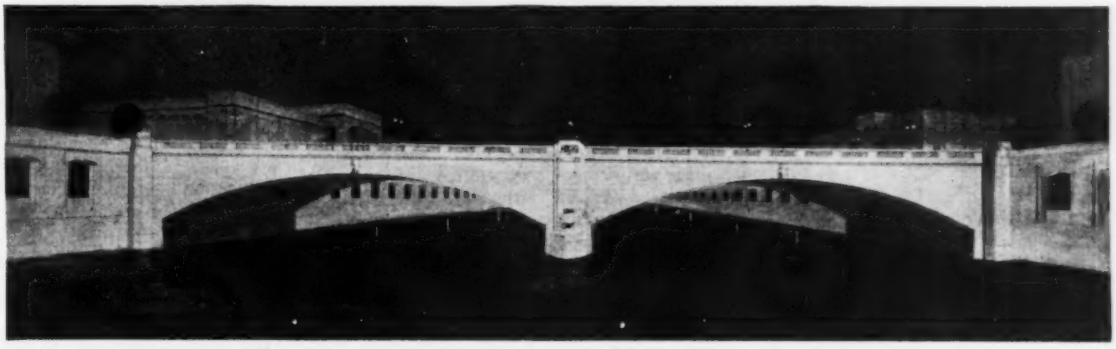
Plans Approved for Reclamation Project in California

The Los Angeles County board of supervisors has approved plans of E. C. Eaton, chief engineer of the Los Angeles County flood-control district, for construction of a channel for the lower end of the San Gabriel River and the reclamation of about 300 acres of bottom land.

The plan calls for making about 4,000 ft. of channel and construction of 1,500 ft. of jetties from the mouth of the river into the bay. The jetties would be built in 500-ft. units, one at a time, to allow sand to collect and build up a new beach front. Construction of a channel would require the moving of approximately 650,000 cu.yd. of earth, use of 180,000 tons of rock for riprap, 100,000 tons of sheet steel piling and 500 cu.yd. of concrete.

It is estimated that the project will cost $750,000, including two bridges.

PROPOSED MARKET STREET BRIDGE OVER SCHUYLKILL RIVER, PHILADELPHIA



Construction work has been started by Dravo Contracting Co. on the new Market St. bridge over the Schuylkill River, Philadelphia, being built by the department of city transit. The new under-river crossing of the four-track Market St. subway will be built through the pier and abutments of the new bridge. Dravo's first job on the project was to build a temporary highway bridge south of the present Market St. structure, in which the trusses used in hanging arch centers for the near-by P.R.R. bridge (*Engineering News-Record*, Feb. 13, 1930, p. 282) were utilized. The new bridge will have two clear arch spans of 164 ft. In the east approach and under the river the subway box will rest in a rock cut, but for some distance west it will be carried on pipe piling.

Sacramento Votes Bonds for New Sedimentation Basin

By a majority of seven to one the voters of Sacramento, Calif., on March 10 authorized a $480,000 bond issue to build a new sedimentation basin for the municipal water-treatment plant now serving the city. The added unit is urgently needed because the present basin is so cracked that there is danger of collapse. An analysis of the serious structural conditions which threaten the existing unit and a resulting recommendation for building a new basin were contained in a recent report by H. D. Dewell, consulting engineer, San Francisco (*Engineering News-Record*, Jan. 29, 1931, p. 203). Operating problems involved in the proposed plant change have been reviewed by J. W. Ellms, Cleveland, and R. E. McDonnell, Kansas City. Plans for the new work are about completed and the project will be rushed because the emergency nature of the situation demands immediate attention.

The Sacramento filtration plant, one of the outstanding water-treatment plants on the Pacific Coast, was built 1921-24 to provide filtered Sacramento River water to the city, which had been using an untreated supply from the same source. The original $1,800,000 bond issue was voted in 1919 following years of controversy over the type of development to be made. Construction was begun in 1921, and the plant was first put into operation in the spring of 1924. In the same year the wall between the sedimentation basin and the grit chamber collapsed (*Engineering News-Record*, Sept. 4, 1924, p. 375) during cleaning of the latter, but the necessary repairs were made without interrupting the operation of the plant.

An examination and report by Mr. Dewell in 1925 on the structural elements of the existing plant (*Engineering News-Record*, April 16, 1925, p. 639) found that foundation settlement of various units had resulted in numerous cracks and recommended an extensive program of repairs which later was carried out. In December, 1930, the walls of the sedimentation basin were found to be in such a critical condition as to necessitate the recent emergency bond election to build the new basin.

Concrete Pavement Yardage

Below is given a tabulation of the concrete pavement awards in the United States for the month of February, 1931, and also the total to date as of Feb. 28, classified according to roads, streets and alleys:

	Yardage Awarded During Feb., 1931	Yardage Awarded to Date of Feb. 28
Roads	8,321,025	17,539,294
Streets	1,055,051	1,900,880
Alleys	26,749	70,128
Total	9,402,825	19,510,302

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Hearings in Supreme Court on Hoover Dam Injunction and Delaware River Diversion Cases

HEARINGS were closed last week before the U. S. Supreme Court in the injunction suit brought by Arizona to restrain the other Colorado River basin states and the secretary of the interior from carrying out the Hoover Dam project. Since both sides were permitted to present their arguments, it is not probable that the case will be thrown out of court without further consideration of the evidence. Those familiar with court procedure believe that a decision will not be rendered in the case until after April 13, when the court will meet again following a two weeks' recess.

In asking that the case be dismissed, counsel for the secretary of the interior contended that Arizona would not be injured by the construction of the dam. It was also contended in behalf of the secretary that Arizona need not be concerned about losing its right to take water from the Colorado, since, having refused to sign the compact with the other states, it is as free to divert water as before adoption of the compact by the other states. The attorney general of California pointed out that only one-half of the flow of the Colorado is put to beneficial use. He asserted that it is clearly within the power of Congress to adopt a measure designed to render the river navigable.

The general opinion among those who have been watching the case is that the constitutionality of the project will be upheld. During the argument, however, it was indicated that an important issue hinges upon the right of California to divert water through the all-American canal. Mr. Justice Butler requested information concerning the diversion of water for the benefit of California. Mr. Justice McReynolds raised the question of the right of the government to build a dam for navigation purposes and then take water from one watershed and put it into another for the use of another state.

Delaware Diversion to Be Argued

Exceptions to the special master's report in the Delaware River diversion case are noted in a brief filed before the U. S. Supreme Court by the State of New Jersey on March 16. Argument on these exceptions is scheduled to be heard by the court on April 13. In taking exception to the findings of the special master, New Jersey now contends that appreciable damage will result to its citizens by reason of the diversion and that New York has not made a proper effort to obtain additional water from other sources. The point is also made that the water power which is latent in the Delaware is one of the natural resources necessary to the future development of New Jersey.

The Nicaraguan Canal

Particular benefits would accrue to the Mississippi Valley by the construction of the proposed Nicaraguan Canal, it was stated recently by General Lytle Brown, Chief of Engineers. General Brown, who is studying reports on a survey of the canal site, pointed out that the Nicaraguan route would result in a reduction of more than 500 miles over the Panama Canal route on the distance between New Orleans and the Pacific Coast. On the other hand, New York and other Atlantic ports would be even farther away by this new route than by the Panama Canal.

Should it be disclosed that the conversion of the Panama Canal into a sea level route would be no more costly than the construction of the Nicaraguan Canal, it is believed that the latter project will be deferred.

Brazil's Embargo

Government officials are not alarmed over reports from Brazil of the placing of a three-year embargo against the importation of industrial machinery. In the first place it is doubted that the embargo will amount to more than a temporary stoppage of industrial imports, to permit a general study of the economic situation in Brazil. In the second place it is not believed that the embargo will apply in the case of road-building equipment and mining machinery, which constitute the chief American exports to Brazil. Commercial Attache Jackson, of Rio de Janeiro, has been instructed by the department of commerce to report whether the embargo includes such machinery. This is of importance to American road-machinery builders, as Brazil is engaged in a rather elaborate program of highway construction.

The Business Outlook

Current changes in industrial activity and trade volume are still indecisive as to spring business prospects. This year's early Easter and accumulated replacement demand have stimulated textiles, clothing, shoes and other consumer lines, though February retail results were somewhat disappointing and the automobile sales outlook is still uncertain. Bonus payments and other early March transactions have increased money turnover; steel production continues its slow seasonal rise in contrast to last year; and spring commercial loan expansion has begun. The first year-to-year increase in residential building since its long decline began in 1928, some seasonal improvement in employment, a flattening of the commodity price curve paralleling last year, a better bond market and favorable crop prospects are the main straws of domestic cheer.

—The Business Week, March 18.

Brief News

A NEW POSTAL TERMINAL will be built in Montreal at a cost of about $2,000,000, it has been decided by the dominion government. The terminal will be modeled on the plan of the Toronto terminal.

PURCHASE by the city of Fresno, Calif., for $2,450,000 of the local water system of the California Water Service Co. is announced. The property includes 30 pumping stations and 230 miles of mains.

A NEW HIGHWAY, about 300 miles in length, along the coast line through Brownsville, Tex., to Tampico, Mexico, has been started. This will be the third main highway from the United States into Mexico, the completion of all of which is expected this year.

TRAFFIC through the Holland tunnel increased 10 per cent during 1930, as compared with 1929, according to figures given out by the Port of New York Authority. The tunnel was patronized by 12,067,000 vehicles in 1930, compared with 10,978,000 in 1929, a gain of 1,089,000.

BEGINNING Feb. 9, the Argentine government placed a tax of 2c. Argentine paper per liter on gasoline, the price of which was thus raised from 20c. to 22c. per liter (one liter equals 1.0567 U. S. quarts). The proceeds of this tax will be used to build feeder roads to the main toll roads.

REBUILDING the south breakwater in Milwaukee harbor will start with the opening of navigation this spring and will be completed in one season. The reconstruction of the breakwater, 758 ft. long, calls for raising fifteen reinforced-concrete caissons weighing 1,024 tons each. Contract for the work, amounting to $350,000, has been awarded to Merritt-Chapman & Whitney Corp.

TO ALLEVIATE UNEMPLOYMENT resulting from poor crops and prolonged drought in certain agricultural regions of Spain a highway construction and repair program has been agreed upon by the Spanish government. To carry out the plan the government has authorized a budget appropriation of $1,066,500 for construction and upkeep of highways, and already numerous contracts have been awarded.

APPLICATIONS for principal engineering inspector-superintendent and senior engineering inspector-foreman to fill vacancies in the U. S. Bureau of Public Roads must be on file with the U. S. Civil Service Commission at Washington not later than March 25. Applicants must have been graduated in civil engineering and will be rated on education, training and experience. Entrance salaries for the first-named position range from $2,300 to $2,900 a year; for the second, from $2,000 to $2,600.

DELIVERY of six of the eight tunnel shields that will be used for boring the city-owned subway tubes under the East River between Manhattan and Brooklyn has been made by Alco Products, Inc., a division of the American Locomotive Co., and boring has been begun from the Brooklyn side. The shields are 18½ ft. in diameter, with walls 2½ in. thick. Excavation work is expected to be finished by January, 1932.

SOCIETY CALENDAR

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; spring meeting, Norfolk, Va., April 15.

AMERICAN WATER WORKS ASSOCIATION, New York; annual convention, Pittsburgh, Pa., May 25-29.

AMERICAN WELDING SOCIETY, New York; annual meeting, New York City, April 22-24.

ENGINEERING COUNCIL OF UTAH, at its meeting in Salt Lake City on March 10, was addressed by Roy V. Wright, president, American Society of Mechanical Engineers, on "Responsibility of the Engineer to His Profession."

KENTUCKY-TENNESSEE SECTION, American Water Works Association, has elected the following officers: chairman, H. K. Bell, consultant, Lexington, Ky.; vice-chairman, James Sheahan, general manager, Memphis water-works; secretary and treasurer, F. C. Dugan, chief engineer, Kentucky state board of health, Louisville, Ky. Streamflow, filter-cleaning methods, valuation and rates, the drought and water shortage were topics covered at the recent Nashville meeting.

LOUISIANA ENGINEERING SOCIETY at its meeting on March 9 heard a lecture on European hydraulic laboratories by Prof. W. B. Gregory, of Tulane University, who as a member of the National Hydraulic Laboratory committee traveled with J. R. Freeman through Europe studying laboratory facilities.

NATIONAL FIRE PROTECTION ASSOCIATION will hold its 35th annual meeting in Toronto May 11-15. This will be the first convention held in Canada since 1919, when the association met in Ottawa. Arrangements are being made for an attendance of about 600.

NEW ENGLAND SEWAGE WORKS ASSOCIATION will hold its annual meeting in Hartford, Conn., on April 27. At the morning session papers on chlorination, settling tanks and laboratory tests of sewage will be read and in the afternoon an inspection of the sewage-treatment plant at South Manchester will be made.

PHILADELPHIA ENGINEERS CLUB on March 10 listened to a talk by L. W. Wallace, executive secretary, American Engineering Council, on business cycles. Mr. Wallace urged balancing public works against public needs and deplored the useless delay in public-works construction. He advocated the reorganization of governmental construction departments as a remedy. Pointing out the fact that every prosperous business cycle in the past has had a definite impetus, such as the '49 gold rush, the railroad expansion and the automobile development, Mr. Wallace stated that it may be necessary to reduce the length of the working week to provide an impetus for the next cycle. If such is the case, the speaker declared, it would be up to the engineering profession to provide means for using the increased leisure time of the public during the next two decades.

PUEBLO (COLO.) ENGINEERING SOCIETY has elected the following officers to serve during 1931: president, W. R. Dolan, engineering department, Colorado Fuel & Iron Co.; vice-president, P. C. Croll; secretary, R. T. Denman; treasurer, H. P. Anderson.

TACOMA (WASH.) SECTION, American Society of Civil Engineers at a dinner meeting on March 9 heard an address by Prof. Frederick A. McMillin, of the College of Puget Sound, on "The Glacial Drifts of the Puget Sound Region." The geology of this region is of particular interest to local engineers, as the auxiliary water supply of the city of Tacoma is a system of deep wells at the Sound end of the city. Fred C. Scobey, of Berkeley, Calif.; John C. Stevens, of Portland, Ore., and W. A. Kunigk, of Tacoma, took part in a discussion of the subject.

THE 8-IN. GASOLINE PIPE LINE of the Phillips Petroleum Co., extending from Borger, Tex., to St. Louis, a distance of 681 miles, was opened on March 3. The cost of the line is estimated at $15,000,000. There are but three terminals on the big pipe line—at Wichita, Kan.; at Kansas City, Mo., and at St. Louis.

Personal Notes

ANDREW F. MACALLUM, who has been commissioner of works at Ottawa, Ont., for the past sixteen years, has resigned, effective March 1.

G. H. HEPBURN, formerly with R. W. Hebard & Co. in El Salvador and Colombia, is now chief engineer, Carretera Atlantico, Managua, Nicaragua.

ROLAND L. TURNER, of Buffalo, N. Y., has been appointed consulting engineer to City Engineer Ray F. Otis on grade-crossing elimination work to be done by the New York Central Railroad in Batavia, N. Y.

POWERS HIGGINBOTHAM, city engineer of Baton Rouge, La., from 1927 to 1929, will become commissioner of public parks in that city on May 4. The formal election takes place on April 7, but Mr. Higginbotham was successful in the March primary and his election is assured.

H. J. TAYLOR has been made engineer in charge of the office of the U. S. Bureau of Public Roads at Bismarck, N. D., succeeding S. R. Sharts, who died last fall. H. E. FOWLER, assistant maintenance engineer for the state highway department for the last year and a half, has been appointed assistant to Mr. Taylor.

KENNETH C. GRANT, for the past nine years president of Hamm, Grant & Bruner, Inc., Los Angeles, Calif., has been reelected president of the company, and the firm name has been changed to Grant & Bruner, Ltd. H. A. Hamm severed his connection with the company on Jan. 1. The firm will continue its practice in the design and erection of industrial and commercial buildings, with offices in Los Angeles.

Obituary

CHARLES OTIS RICE, a retired civil engineer and architect, died at Amesbury, Mass., March 6. Mr. Rice, who was 70 years of age, was born in Fulton, N. Y., and for many years was engaged in civil engineering in Michigan and other western states.

JAMES S. ROBINSON, former division engineer of the Chicago & North Western Ry., died on March 8 at his home in Chicago. Mr. Robinson, who was 74 years old, began his service with the railway in 1880 and retired about ten years ago. He was a member of the Western Society of Engineers.

Construction Equipment and Materials

Railway Appliances Exhibition Held in Chicago

Mechanical track tools and maintenance equipment represented the most numerous class of exhibits at the annual show of the National Railway Appliances Association, held in Chicago on March 9 to 12 in connection with the convention of the American Railway Engineering Association. In spite of unfavorable circumstances the show was as large and varied as usual, the main hall and both annexes of the Coliseum being occupied, while a number of intending exhibitors were unable to obtain space.

When the engineering association recently decided to reduce its meeting to two days and proposed the elimination of the usual "railway show" there was no time for the appliances association to discuss the matter with its members, but its board of direction concluded that it would be best to hold the show as usual, rather than risk disrupting an organization built up during several years. That this action was warranted was shown by the extent and high character of the exhibition, although the attendance (as at the convention) was smaller than usual.

Officers of the National Railway Appliances Association as elected for 1931-1932 are as follows: president, A. S. Anderson, of Adams & Westlake Co.; vice-president, F. E. McAllister, of Kalamazoo Railway Supply Co.; secretary (reelected), C. W. Kelly, Chicago.

Equipment Exhibited

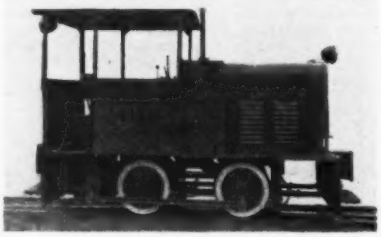
New features among the large display of established machines, devices and materials included the following: pressed steel paving for grade crossings, A. O. Smith Corp., Milwaukee, Wis.; metal cribbing, Armco Culvert Manufacturers Association, Youngstown, Ohio; pneumatic track shifting machine, Baldwin-Southwark Corp., Philadelphia, Pa.; curve guard rail, Republic Steel Corp., Youngstown, Ohio; ballast spreader, Scientific Production Corp., New York; a waterproofing compound for concrete, American Sika Corp., New York, and an overhead frame for the suspension of heavy track tools by coiled springs to relieve the operators from the dead weight, Ingersoll-Rand Co., New York. In the mechanical and labor-saving appliances for track maintenance there was a noticeable increase in number and variety, and also in the increased size and power of several of the machines.

Rail drills, saws, wrenches and grinders, spike drivers and pullers, tie adzers and borers, ballast tampers, track shifters, jacking cars, track movers and weed killers were largely represented by various manufacturers. In track material there was the usual large display of rails, splices, switches, switchstands and frogs, with the Keystone steel tie of the Bethlehem Steel Co., the welded steel tie of the Delaware & Hudson R.R., and different types of welded joints.

Crossing signals were numerous, while paving for crossings included two designs in metal and one of ironbound concrete slabs. Precast concrete units for retaining wall construction were shown by the Prendergast Co., Marion, Ohio, and precast culverts by the Massey Concrete Products Co., Chicago. Rail-oiling devices, to reduce wear on curves, were shown by the P. & M. Co., Chicago, and the Q. & C. Co., New York. The usual extensive display of motor track cars of all kinds was enlivened by many of the cars being painted a brilliant yellow instead of the usual more somber colors. Among them stood a large track-inspection car, with automobile type of body, built by the Buda Co., Harvey, Ill., for the Union Pacific.

6-Ton Diesel Locomotive

The modern tendency toward the use of low-grade fuel in construction equipment is exemplified in the 6-ton diesel-equipped locomotive illustrated herewith, which was recently shipped by the Vulcan Iron Works, Wilkes-Barre, Pa., for use in the Southern oil fields. This machine is powered with a Cummins diesel engine developing 48 hp. at 1,200 r.p.m. governed speed. Engine equipment includes oil filter, electric starting and lighting system, and tubular type radiator. The transmission is of the constant mesh jaw clutch type, has four speeds in either direction and will operate the locomotive from 2.3 to 12 m.p.h. in high gear. A starting tractive effort of 3,000 lb. is developed. Traction is secured to front wheels through crank pins and side rods. The driving wheels are 20 in. in diameter with rolled-steel tires shrunk on cast-iron centers; track gage is 24 in.



Diesel motor drives light locomotive

Rollover Scraper Fitted With Hydraulic Control

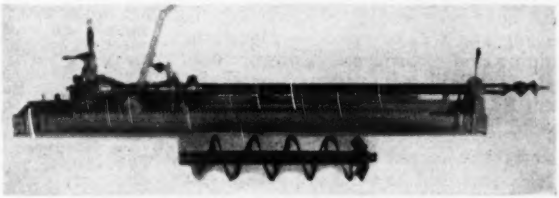
Ability to control closely both cutting and spreading depths is given the operator of the new 1¼-yd. rollover scraper introduced by the LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa, by the addition of a hydraulic control system operated by the tractor operator from his driving seat. This variable adjustment and the use of a narrower and deeper bowl than is conventional make loading easier and permit the hauling of larger quantities with the same power unit. The scraper, which follows the conventional design of this type of unit, is 5 ft. wide and contains 48 cu.ft. It is designed for operation with a Caterpillar 30 tractor. The bowl is provided with a crucible cast-steel cutting edge running the full width

1¼-cu.yd. hydraulic rollover scraper

with two additional 6-in. cutting edges at each side to facilitate breaking through top soil. At the rear of the carrying surface an extra cutting edge is provided which is interchangeable with the front edge. Three 6-in. crucible cast-steel runners are provided on the bottom of the pan to reduce wear and protect the bowl when the scraper is in carrying position. The tongue is made of a 5-in. H-beam which is rigidly reinforced and braced at the side of the bowl. Power is furnished to the jack by a simple rotary gear pump which is mounted on the tractor power take-off.

Precise Boring Machine for Installing Pipes

Installation of pipes, conduits and sewers under streets or other areas where trenching is undesirable is the function of a new boring machine now being manufactured by the Hydrauger Corp., Ltd., 1298 Bryant St., San Francisco, Calif. A feature of this device is its accuracy; it is claimed that it is possible to aim a hole through a 40-ft. embankment and bring it out within 2 or 3 in. of the point desired.



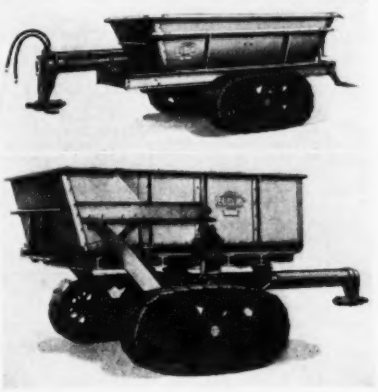
Hydraulic boring machine and reamer

Holes up to 120 ft. in length can be bored with slightly less accuracy. The Hydrauger is driven by compressed air and is connected with running water under pressure, which passes through the boring shaft to the auger point. As only a small amount of water is used, the ordinary faucet provides a satisfactory source when pressure of not less than 25 lb. per sq.in. is available. Otherwise, water can be transported in a barrel and circulated by a small air-driven pump. The rate of boring progress, which is controlled by a simple reversible ratcher, varies from ½ to 2 ft. per minute, depending upon earth conditions and the size of the hole. Two models of the machine are available, the smaller for holes of 2½-5 in. diameter, and the larger of 5-10½ in. diameter.

Use of the machine requires two men and a compressor with a capacity of approximately 110 cu.ft. per minute. Power for rotating the bit is developed by an air motor of 1.75 or 3.1 hp., operating at a pressure of 85 lb. per sq.in. and consuming, for the two models, 54 or 80 cu.ft. per minute.

Large Crawler-Mounted Wagons

Hydraulic bottom-dump wagons in sizes from 5½ to 8 cu.yd. and a gravity rear-dumping model with a capacity of 8 cu.yd. are among the new pieces of equipment which have been announced by the road-machinery division of the Euclid Crane & Hoist Co., Cleveland, Ohio. All of these models are fitted with the improved Euclid track-wheel mounting and are intended for tractor operation, either singly or in trains.

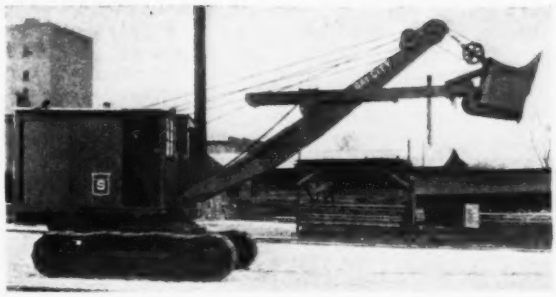


Hydraulic and gravity dump wagons

The hydraulic bottom-dump wagons are built in 5½-, 6-, 7- and 8-cu.yd. capacities. The 5½- and 7-yd. sizes have one low side for elevating grader use, but can be converted into 6- and 8-yd. wagons by adding extensions to the low sides and ends. Hydraulic pressure is supplied by a simplified pump attached to the rear of the tractor. The door-lifting jack is located inside the tubular section of the wagon drawbar, affording complete protection to the jack and keeping out dirt and dust. For inspection or repair the jack can be pulled out through a removable cover plate at the end of the tubular section. These wagons are designed and built to operate either with the hydraulic pump or by hand, a hand-winding mechanism being retained on the rear of the wagon so that it can be used even though the pump-equipped tractor is not available. An additional feature is a drawbar lifting jack, which makes the operation of attaching or detaching the wagon from the tractor a one-man job instead of a laborious task for several men.

The 8-cu.yd. gravity rear-dump wagon is particularly constructed for working under a shovel and for hauling rock, dirt, clay, sand or shale. The body is dumped by means of a trip cord from the driver's seat of the tractor to a lever on the wagon. When empty, the body automatically falls back into loading position. No human or mechanical assistance is necessary for either operation and no man is required at the dump. The rear gate is so arranged as to rise at a steep angle, freeing the material at the start of dumping and allowing ample space for discharging all loads. For hauling large rocks this gate can easily be removed, leaving the rear end open.

Bodies for both wagons are made of extra heavy steel plates, well braced with steel angles and corner gussets. Features of the improved track-wheel mounting include wider and stronger shoes, larger openings in the box section, thicker rails, hardened steel bushings and harder shoe pins, carefully ground to give closer accuracy.



1-cu.yd. excavator with shovel rig

Convertible 1-Cu.Yd. Excavator

A larger addition to the line of convertible power shovels and cranes produced by Bay City Shovels, Inc., Bay City, Mich., has been announced in the model S, a full revolving convertible excavator with full-crawler mounting and inclosed steel cab, which is available with gasoline, oil engine or electric power. Rated capacity, as a shovel or excavator, is a full cubic yard; as a crane the machine will raise 17 tons at a 12-ft. radius. Attachments include shovel, dragline, trench hoe, clamshell or crane boom. The shovel boom is 21 ft. long, with chain crowd and cast manganese dipper. Crane booms vary from 35 to 60 ft. in length. In design the model S follows the pattern of other Bay City models, with exceptionally large diameter center pin and swing circle, cast car body and machinery table, ball and roller bearings for all machinery shafting, high-pressure lubrication, machine cut or forged and hardened steel gears, and wide clutch surfaces.

Wire Rope of Stainless Steel

Nirosta austenitic chrome nickel alloy steel is now being used by the Hazard Wire Rope Co., Wilkes-Barre, Pa., in the manufacture of preformed wire rope which is said to be immune to attack by salt water, salt air or chemicals and which will operate safely in temperatures up to 1,650 deg. F. The new product is being marketed under the name "Korodless." In the process of manufacture the strands and wires are helically shaped to the exact form they assume in the rope structure, so that internal stress is eliminated and it is not necessary to seize the strands before cutting.

Small Loader for Fine Materials

A small bucket loader that will operate inside a box car and will handle any bulk material with lumps not exceeding 4-in. size at the rate of ½ cu.yd. per minute has been released by the Barber-Greene Co., Aurora, Ill. This machine is wheel mounted, self-feeding and is powered by a 5-hp. inclosed, fan-cooled, ball-bearing electric motor operating at 1,800 r.p.m. A pawl-and-ratchet feeding mechanism is used for crowding into the material. By simply reversing the pawl, the feeding drive is reversed for backing out. A simple arrangement on the pawl and ratchet

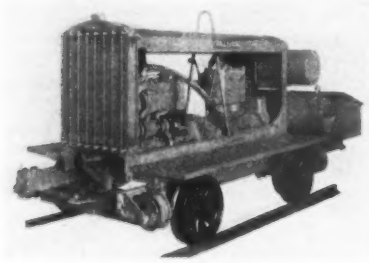
Bucket loader operating in box car

makes five feeding speeds available in both directions. When the machine is not feeding and is to be moved about, the drive is disengaged and one man tilts the boom back on the chassis, raising the feeding end off the ground. This is easily done, since the boom is supported on the chassis almost at the center of gravity. The machine is mounted on two 30-in. roller-bearing wheels with a 10-in. roller-bearing caster wheel for steering.

Material is fed into the buckets by a spiral ribbon-type feeder. The diameter of the ribbon is 24 in. and the machine makes a cut 4 ft. wide. Special welded steel buckets, 10x4¼x6 in., are spaced 8 in. apart. The whole bucket line is housed to reduce dust when handling bulk cement or like material. For loading wheelbarrows or buggies, a canvas chute is hung from the discharge end for the same purpose. In working position, the loader is only 7 ft. high, 6 ft. 9 in. long and 4 ft. wide.

Rail Mounted Air Compressor Available in Four Sizes

Portable gasoline-engine-driven air compressors for railway maintenance work have been placed on the market by the Sullivan Machinery Co., 400 North Michigan Ave., Chicago, Ill., in four sizes to supply, respectively, 4, 8, 12 and 16 tie tampers. All machines are of the same general design, differing only in the size of engine and compressor units. The latter are of the single acting type, equipped with either two or four cylinders 5½x5 in. or 6½x5½ in. in size. The two larger units are compressors of the V-type, the four cylinders being set in pairs at an angle of 90 deg. Compressors are driven by direct connection with Buda four-cylinder, four-cycle engines of 23, 34, 46 and 67 hp., respectively. Engines and compressors are substantially mounted on heavy electric steel frames, and are equipped with magneto ignition, air filters on both compressor and engine intakes, speed governors and slow-down governors. Running gears consist of 3-in. square steel bar axles with heavy-duty wheels equipped with Alemite lubrication and Hyatt roller bearings. The cross-wheels, or unloading gear, have double flanges, and an eccentric arrangement by means of which the entire unit can be rapidly jacked clear of the standard-gage rails. A special quick-action jack is employed for this work, and the wheels are locked in the desired position by means of substantial pawls. Unloading wheels are also equipped with roller bearings and Alemite lubrication. In addition, a bail is provided to facilitate lifting the compressor with a crane without the use of chains or a sling.



Railway mounted air compressor unit

The compressor, under varying loads, is regulated by a simple pilot valve governed by air receiver pressure. Interlocking with this system is an automatic engine control by air pressure, working through the carburetor throttle to idle the engine when the compressor is unloaded.

New Publications

Expansion Joints—A discussion of the need for expansion joints and directions for installing these by means of the Flex-Plane and Cleft-Plane joint installing machines are given in a 12-p. illustrated bulletin L-5 issued by the Flexible Road Joint Machine Co., Warren, Ohio.

Window-Washing System — Advantages of Cleveland tramrail installations on the exteriors of buildings to form a permanent window-washing system are outlined in a 4-p. folder issued by the electric tramrail division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Concrete Admixture—Colloy, a colloidal-type inert workability admixture for concrete, is described in form 201-C, a 4-p. leaflet issued by the Colloy Products Co., 4030 Chouteau Ave., St. Louis, Mo.

Bucket Loader—Improvements made in the Link-Belt Grizzly crawler loader are described in folder 1256 of the Link-Belt Co., 910 South Michigan Ave., Chicago, Ill.

Concrete Mixer—Details regarding a new 14-S concrete mixer which follows the pattern of larger units manufactured by the Ransome Concrete Machinery Co., Dunellen, N. J., are given in bulletin 127, issued by that company.

Fire-Resistant Lumber — An account of six recent tests held to demonstrate the resistance to heat and flame of Firesafe treated lumber as compared with untreated lumber is given in a 4-p. folder produced by the Chesebro-Whitman Co., Inc., Long Island City, N. Y.

Hydrants — Special features of the Mathews modernized fire hydrant are described and illustrated in the folder issued by R. D. Wood & Co., 400 Chestnut St., Philadelphia, Pa.

Motion Pictures — A number of motion picture films illustrating the use of explosives are described in a bulletin recently issued by E. I. du Pont de Nemours & Co., Wilmington, Del. All the films will be loaned by the company free of charge.

Motor Trucks—"Back of the Mack" is the title of a 20-p. booklet issued by Mack Trucks, Inc., 25 Broadway, New York City, which tells the history of the Mack organization and gives a brief résumé of its products, including motor trucks, tractors and trailers, buses, fire apparatus and switching locomotives.

Air Compressors—Dual compressor control, a method of regulation which compensates for varying air demand, thus decreasing power consumption and reducing unnecessary wear on the compressor, is described in a 4-p. folder issued by the Pennsylvania Pump & Compressor Co., Easton, Pa.

Tunneling Methods—Methods used in boring 31 recent tunnels in various parts of the world are given in a 92-p. illustrated volume on rock tunnel methods issued by the Hercules Powder Co., Inc., Wilmington, Del. Subjects covered include drilling, blasting, excavating, transportation, ventilation methods and tunnel lining. The information was compiled by Theodore Marvin, editor of *The Explosives Engineer*, assisted by Douglas C. Corner, president of the St. Louis Power Shovel Co. A companion volume, "Drilling and Blasting in Some American Metal Mines," is also available.

COSTS AND CONTRACTS

E. N.-R. Index Numbers

Cost			Volume		
Mar., 1, 1931	194.51		February, 1931	198	
Feb., 1, 1931	196.61		January, 1931	208	
Mar., 1, 1930	206.80		February, 1930	204	
Average, 1930	202.85		Average, 1930	260	
Average, 1929	207.02		Average, 1929	317	
1913	100.00		1913	100	

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of March 19, with some comparisons, total as follows:

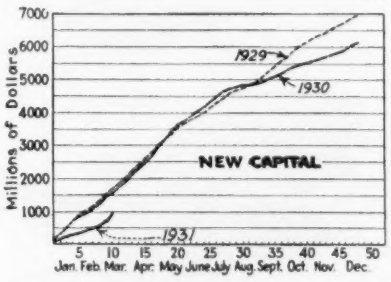
(In Thousands of Dollars)

	Mar. 19 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$2,958	$4,421	$8,941
Other	15,931	14,190	29,578
Streets and roads.	12,472	11,877	9,197
Other eng. constr..	85,454	28,561	40,264
Total	$116,815	$59,050	$87,981
Total, all classes Jan. 1 to March 19:			
1931			$617,024
1930			729,919

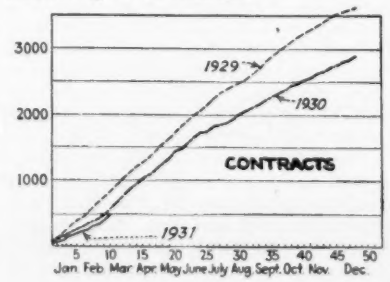
Largest Week's Financing

New corporation capital and public bond sales in the first week of March totaled 136 million dollars, compared with an average of 72 in February and 81 in January. Total for the second week is 201 millions. This includes three railroad issues for stations and electrification: 75 million 4½s New York Central; 50 million 4½s Pennsylvania; 13.94 million 4¾s Boston & Maine.

The cumulative total for the year to date is 998 millions, compared with 1,592 millions in 1930. Of this, 47 per cent is for public work, 53 for private.



Engineering construction contracts totaled 37 millions last week, compared with 48 the week before, 45 for the year to date, and 61 millions averaged in 1930. The current week's total will be swelled by the Hoover Dam award, amounting to 48 millions.



Current Construction Unit Prices

Complete Unit Prices for Hoover Dam

THREE bids for the construction of the Hoover dam, power plant and diversion tunnels on the Colorado River at the Black Canyon dam site, 30 miles southeast of Las Vegas, Nev., were received by the U. S. Bureau of Reclamation on March 4, 1931. The bidders were: (A) Six Companies, Inc., 526 Phelan Building, San Francisco, Calif., $48,890,995; (B) Arundel-Atkinson Co., Baltimore and Los Angeles, $53,893,878; (C) Woods Bros. Corp., Lincoln, Neb., $58,653,107. Contract was awarded on March 11 to the low bidder. Six Companies, Inc., is a combination of the following: Utah Construction Co.; Henry J. Kaiser and W. A. Bechtel; McDonald & Kahn Co., Ltd.; Morrison-Knudson Co.; J. F. Shea Co.; and Pacific Bridge Co. Work must be started within 30 days of the award. Contracts for preliminary work consisting of a construction railroad and a highway were let earlier in the year for $785,477.

A full description of the work covered by this contract appeared in *Engineering News-Record*, Dec. 25, 1930, pp. 1011-1017. It consists of five major divisions: (1) diversion works, consisting of upstream and downstream cofferdams and four 50-ft. tunnels approximately 4,000 ft. long; (2) a concrete arch gravity dam, 1,180 ft. long on the crest and 730 ft. high, with a radius of curvature of 500 ft.; (3) two spillways, one on each side of the river, each consisting of a 50x50-ft. stoney gate, a concrete ogee overflow crest 700 ft. long, and a concrete-lined open channel; (4) twin outlet works of similar design and capacity, each consisting of two separate systems regulated by cylinder gates in the bottom of intake towers; (5) a U-shaped power house of concrete and structural steel immediately below the dam.

The government will furnish all materials and equipment that become a permanent part of the completed structure, delivered to the contractor f.o.b. cars at Boulder City. For the power house, hydraulic and electrical machinery, equipment and wiring will be installed by the government, the contractor placing concrete around such machinery as it is installed. The government will also furnish and install an inclined freight-car elevator on the canyon wall immediately below the power house on the Nevada side. This will connect a highway at El. 1,261 with the bottom of the canyon at El. 667.

Material to be furnished by the contractor includes sand, stone, gravel and cobbles for concrete (to be taken without charge from government-owned property 8 miles from the dam), form material, lumber for temporary tunnel timbering, steel liner plates, embankment and backfill materials, and pipe and fittings not required for permanent installations.

Concrete will be cooled during the setting period by water running through 800,000 lin.ft. of 2-in. standard pipe or boiler tubing connected to a refrigeration plant provided and operated by the contractor.

Most of the work to be carried on for the first three years will consist of excavation and tunneling. Placing concrete in the dam is not scheduled to start until Dec. 1, 1934. A time allowance of 2,565 calendar days, approximately 7 years, is given for final completion of the contract, with a penalty of $3,000 per day for each division of the work as liquidated damages for failure to conform to the time limits. The surety bond for proper performance is set at $5,000,000.

The Hoover dam is being built by the U. S. Bureau of Reclamation under the direction of Elwood Mead, commissioner. Raymond F. Walter is chief engineer of the bureau; John L. Savage, chief designing engineer; Walker R. Young, construction engineer. Officers of Six Companies, Inc., include William H. Wattis, president, W. A. Bechtel, first vice-president, and F. T. Crowe, general manager.

Item	Work or Material	Quantity		A Price	A Amount	B Price	B Amount	C Price	C Amount
	Excavation:								
1	All classes, stripping canyon walls of loose rock	150,000	cu.yd.	$4.50	$675,000	$3.00	$450,000	$3.50	$525,000
2	Common, open cut for diversion tunnels	59,000	cu.yd.	4.00	236,000	3.50	206,500	3.50	206,500
3	Rock, open cut for diversion tunnels	344,000	cu.yd.	4.50	1,548,000	3.50	1,204,000	3.25	1,118,000
4	All classes, diversion tunnels	1,563,000	cu.yd.	8.50	13,285,500	8.50	13,285,500	8.00	12,504,000
5	Common, open trench for concrete cut off, upstream cofferdam	1,000	cu.yd.	3.75	3,750	2.11	2,110	20.00	20,000
6	Rock, open trench for concrete cutoff, upstream cofferdam	500	cu.yd.	10.00	5,000	5.82	2,910	25.00	12,500
7	Removal of earthfill, downstream cofferdam	230,000	cu.yd.	0.25	57,500	1.20	276,000	1.25	287,500
8	Removal of rockfill, downstr'm cofferdam and rock barrier	191,000	cu.yd.	0.50	95,500	1.66	317,060	1.70	324,700
9	Common, foundations of dam, pwr. house and cofferdams	857,000	cu.yd.	2.20	1,885,400	1.26	1,079,820	2.50	2,142,500
10	Rock, foundation of dam	400,000	cu.yd.	4.40	1,760,000	3.40	1,360,000	4.00	1,600,000
11	All classes, upstream cutoff trench in dam foundation	35,000	cu.yd.	12.00	420,000	4.79	167,650	5.00	175,000
12	All classes, spillways in open cut	1,012,000	cu.yd.	2.60	2,631,200	2.30	2,327,600	3.00	3,036,000
13	All classes, inclined spillway tunnels	144,000	cu.yd.	8.20	1,180,800	8.50	1,224,000	10.00	1,440,000
14	All classes, canyon wall valve houses	255,000	cu.yd.	2.20	561,000	3.00	765,000	2.00	510,000
15	All classes, intake towers	300,000	cu.yd.	2.20	660,000	3.00	900,000	3.00	900,000
16	All classes, shafts for outlet works and connecting galleries	29,000	cu.yd.	8.00	232,000	8.50	246,500	10.00	290,000
17	All classes, penstock tunnels and power penstock	176,000	cu.yd.	8.00	1,408,000	8.50	1,496,000	8.00	1,408,000
18	Rock, power house	122,000	cu.yd.	2.20	268,400	3.25	396,500	4.00	488,000
19	All classes, switching station	16,500	cu.yd.	1.75	28,875	2.11	34,815	2.00	33,000
20	All classes, inclined freight elevator structures	40,000	cu.yd.	3.00	120,000	3.00	120,000	4.00	160,000
21	Common, highway	3,700	cu.yd.	0.50	1,850	2.39	8,843	2.00	7,400
22	Rock, highway	109,000	cu.yd.	2.00	218,000	2.39	260,510	2.00	218,000
23	All classes, highway structures	1,000	cu.yd.	3.75	3,750	2.63	2,630	3.00	3,000
24	Backfill, power house	1,300	cu.yd.	2.00	2,600	0.74	962	2.50	3,250
25	Backfill, switching station	4,400	cu.yd.	1.00	4,400	0.37	1,628	1.00	4,400
26	Backfill, on roofs	35,000	cu.yd.	1.00	35,000	1.71	59,850	2.50	87,500
27	Rockfill, upstream cofferdam	151,000	cu.yd.	1.00	151,000	1.19	179,690	2.00	302,000
28	Rockfill, downstream cofferdam	63,000	cu.yd.	1.00	63,000	1.34	84,420	2.00	126,000
29	Rock protection in river channel and elsewhere	84,000	cu.yd.	0.75	63,000	1.34	112,560	2.00	168,000
30	Rock blanket on upstream cofferdam	13,000	cu.yd.	2.00	26,000	2.60	33,800	2.50	32,500
31	Rock barrier below downstream cofferdam	127,000	cu.yd.	1.35	171,450	0.37	46,990	1.50	190,500
32	Earthfill in upstream cofferdam	568,000	cu.yd.	1.00	568,000	0.98	556,640	2.00	1,136,000
33	Earthfill in downstream cofferdam	230,000	cu.yd.	1.00	230,000	0.98	225,400	2.00	460,000
34	Rubble masonry walls	7,500	cu.yd.	12.00	90,000	7.40	55,500	9.00	67,500
	Drilling:								
35	Grout holes in tunnels, adits and shafts	232,000	lin.ft.	1.00	232,000	0.70	162,400	2.00	464,000
36	Grout holes in foundations for dam and spillway crests, not more than 50 ft.	6,500	lin.ft.	3.00	19,500	2.20	14,300	3.00	19,500
37	Do., 51-100 ft.	25,000	lin.ft.	4.00	100,000	2.75	68,750	3.00	75,000
38	Do., 101-150 ft.	17,000	lin.ft.	4.00	68,000	3.30	56,100	3.00	51,000
39	Holes for anchor bars and grouting bars in place	23,500	lin.ft.	1.00	23,500	0.55	12,925	2.00	47,000
40	Drainage holes in dam foundation, not more than 50 ft. deep	5,600	lin.ft.	3.00	16,800	2.20	12,320	4.00	22,400
41	Do., 51-100 ft.	28,000	lin.ft.	4.00	112,000	2.40	67,200	4.00	112,000
42	Do., 101-150 ft.	500	lin.ft.	6.00	3,000	3.30	1,650	4.00	2,000
43	Pressure grouting, tunnels, adits and shafts	376,000	cu.ft.	1.00	376,000	0.45	169,200	2.00	752,000
44	Pressure grouting, foundations for dam and spillway crests	12,000	cu.ft.	1.00	12,000	0.45	5,400	2.00	24,000
45	Pressure grouting, contraction joints in dam	34,000	cu.ft.	1.00	34,000	0.80	27,200	2.00	68,000
46	Man'f'g and placing porous concrete drain tile in dam	38,400	lin.ft.	2.00	76,800	2.25	86,400	2.50	96,000
47	Placing tile roofs	10,000	sq.ft.	0.25	2,500	0.11	1,100	0.30	3,000
48	Placing asphalt saturated feltroofing, comp. with flashing	120,000	sq.ft.	0.15	18,000	0.06	7,200	0.08	9,600

Current Construction Unit Prices—Hoover Dam Bids (Continued)

Item	Work or Material	Quantity		A Price	A Amount	B Price	B Amount	C Price	C Amount
	Mixing and Placing Concrete:								
49	Inlet structures, inner diversion tunnels	5,600	cu.yd.	20.00	112,000	20.40	114,240	15.00	84,000
50	Inlet structures, outer diversion tunnels and bulkhead gates	13,400	cu.yd.	20.00	268,000	6.59	88,306	10.00	134,000
51	Outlet structures, diversion tunnels	5,800	cu.yd.	20.00	116,000	10.28	59,624	11.00	63,800
52	Lining diversion tunnels	312,000	cu.yd.	11.00	3,432,000	8.00	2,496,000	15.00	4,680,000
53	Paving upstream cofferdam	3,500	cu.yd.	10.00	35,000	8.13	28,455	7.00	24,500
54	Dam	3,400,000	cu.yd.	2.70	9,180,000	4.15	14,110,000	3.40	11,560,000
55	Parapets	6,600	cu.yd.	5.00	33,000	27.00	178,200	16.00	105,600
56	Spillway structures	51,000	cu.yd.	10.00	510,000	12.84	654,840	11.00	561,000
57	Lining inclined spillway tunnels	29,000	cu.yd.	10.00	290,000	15.20	440,800	15.50	449,500
58	Diversion tunnel plugs	121,000	cu.yd.	4.00	484,000	8.00	968,000	5.00	605,000
59	Lining outlet and penstock tunnels	26,000	cu.yd.	10.00	260,000	10.00	260,000	12.00	312,000
60	Lining shafts for outlet works and connecting galleries	10,200	cu.yd.	10.00	102,000	10.00	102,000	11.00	112,200
61	Canyon wall outlet works	51,000	cu.yd.	6.00	305,000	8.59	438,090	10.00	510,000
62	Intake towers, foundations and superstructures	108,000	cu.yd.	6.00	648,000	8.34	900,720	10.50	1,134,000
63	Bridges to intake towers	1,000	cu.yd.	20.00	20,000	38.60	38,600	19.00	19,000
64	Power house above generator floor	28,000	cu.yd.	10.00	280,000	15.00	420,000	15.00	420,000
65	Power house below generator floor and in penstocks	115,000	cu.yd.	6.50	747,500	8.49	976,350	8.00	920,000
66	Switching station and steel tower footings	600	cu.yd.	12.00	7,200	9.26	5,556	17.00	10,200
67	Inclined freight elevator structures	4,800	cu.yd.	10.00	48,000	9.04	43,392	12.00	57,600
68	Highway structures	900	cu.yd.	20.00	18,000	25.75	23,175	17.00	15,300
69	Gunite surfacing on concrete, 1" thick	50,000	sq.yd.	0.75	37,500	1.64	82,000	2.50	125,000
70	Special finishing of walls in power house, parapets and other concrete surfaces	250,000	sq.ft.	0.05	12,500	0.104	26,000	0.08	20,000
71	Placing ¾-in. finish on concrete floors	50,000	sq.yd.	0.50	25,000	1.26	63,000	0.55	27,500
72	Thin walls of metal lath and plaster	4,000	sq.yd.	1.00	4,000	4.75	19,000	4.00	16,000
73	Placing reinforcements bars and rails	35,000,000	lb.	0.0075	262,500	0.022	770,000	0.02	700,000
74	Placing anchor bars in rock	168,000	lb.	0.02	3,360	0.02	3,600	0.12	20,160
75	Installing standard pipe, fittings and valves	6,600,000	lb.	0.025	165,000	0.042	277,200	0.08	528,000
76	Installing control piping for high-pressure gates	51,700	lb.	0.05	2,585	0.065	3,360.50	0.17	8,789
77	Laying metal pipe for highway drains and culverts	10,000	lb.	0.10	1,000	0.05	500	0.03	300
78	Installing conduit lining castings	9,570,000	lb.	0.01	95,700	0.012	114,840	0.035	334,950
79	Installing conduit linings for outlet works	6,435,000	lb.	0.01	64,350	0.013	83,655	0.025	160,875
80	Installing conduit linings for power penstock	13,915,000	lb.	0.01	139,150	0.0165	229,597.50	0.025	347,875
81	Installing structural steel, except bridges to intake towers	17,875,000	lb.	0.01	178,750	0.013	232,375	0.02	357,500
82	Installing structural steel in bridges to intake towers	577,500	lb.	0.025	14,437.50	0.013	7,507.50	0.025	14,437.50
83	Installing trash rack metal work	2,340,800	lb.	0.01	23,408	0.0165	38,623.20	0.02	46,815
84	Driving steel sheet piling for upstream cofferdam	704,000	lb.	0.05	35,200	0.04	28,160	0.025	17,600
85	Installing track rails	413,000	lb.	0.01	4,130	0.013	5,369	0.02	8,260
86	Installing metal work in freight elevator guide structure	330,000	lb.	0.01	3,300	0.02	6,600	0.025	8,250
87	Installing metal floor plates	132,000	lb.	0.01	1,320	0.02	2,640	0.02	2,640
88	Installing metal stairways	303,000	lb.	0.01	3,030	0.04	12,120	0.035	10,605
89	Furnishing and erecting steel ribs, steel liner plates and arching segmental bars in tunnels, adits and shafts	3,170,000	lb.	0.075	237,750	0.12	380,400	0.20	634,000
90	Installing 50x50-ft. stoney gates and hoists	2,600,000	lb	0.02	52,000	0.021	54,600	0.025	65,000
91	Installing high-pressure, hydraulically operated gates	10,340,000	lb.	0.01	103,400	0.014	144,760	0.03	310,200
92	Installing cylinder gates and hoists in intake towers	4,620,000	lb.	0.01	46,200	0.016	73,920	0.03	138,600
93	Installing needle valves	4,070,000	lb.	0.01	40,700	0.014	56,980	0.025	101,750
94	Installing travelling cranes	295,000	lb.	0.01	2,950	0.02	5,900	0.018	5,310
95	Furnishing, installing and operating cooling plant	Lump sum	lb.		360,000		300,000		400,000
96	Installing electrical cable for resistance thermometers embedded in concrete	20,000	lin.ft.	0.08	1,600	0.026	5,200	0.05	1,000
97	Installing electrical metal conduit not larger than 1 in.	75,000	lin.ft.	0.10	7,500	0.13	9,750	0.15	11,250
98	Do. 1¼-2½ in.	60,000	lin.ft.	0.13	7,800	0.20	12,000	0.35	21,000
99	Do. 3 -4 in.	2,000	lin.ft.	0.18	360	0.80	1,600	0.60	1,200
100	Do. 4½-6 in.	500	lin.ft.	0.25	125	1.30	650	1.00	500
101	Installing fiber conduit	2,000	lin.ft.	0.13	260	0.26	520	0.20	400
102	Installing metal sash windows and partitions	75,000	sq.ft.	0.18	13,500	0.30	22,500	0.25	18,750
103	Installing metal sash window operators	120,000	lb.	0.10	12,000	0.13	15,600	0.08	9,600
104	Installing metal swing doors	3,200	sq.ft.	0.35	1,120	0.70	2,240	0.70	2,240
105	Installing metal rolling doors	500	sq.ft.	0.35	175	0.65	325	0.70	350
106	Installing wooden doors	800	sq.ft.	0.20	160	0.65	520	0.50	400
107	Placing hollow clay tile walls and ceilings	2,000	sq.yd.	2.00	4,000	2.50	5,000	1.75	3,500
108	Placing ceramic tile walls and floors	250	sq.yd	4.00	1,000	4.70	1,175	6.00	1,500
109	Installing plumbing fixtures and hardware accessories	10,000	lb.	0.20	2,000	0.30	3,000	0.20	2,000
110	Installing steel partitions	10,000	lb.	0.12	1,200	0.07	700	0.15	1,500
111	Installing sheet metal work	33,000	lb.	0.20	6,600	0.20	6,600	0.25	8,250
112	Placing copper expansion strips in contraction joints	150,000	lin.ft.	0.25	37,500	0.30	45,000	0.15	22,500
113	Installing miscellaneous items of metal work	231,000	lb.	0.10	23,100	0.05	11,550	0.10	23,100
114	Transporting l.c.l. freight for other than the contractor between delivery yard and end of construction railroad	60,000	cwt.	0.10	6,000	0.10	6,000	0.12	7,200
115	Do. car lots	1,000	car	25.00	25,000	10.00	10,000	20.00	20,000
116	Unloading freight for other than the contractor at the end of the construction railroad and placing in warehouse	60,000	cwt.	0.25	15,000	0.13	7,800	0.25	15,000
117	Transporting l.c.l. freight for other than the contractor between end of construction railroad or warehouse and power house	60,000	cwt.	0.50	30,000	0.13	7,800	0.40	24,000
118	Do., car lots	500	car	50.00	30,000	60.00	36,000	300.00	180,000
119	Excavation—All classes, stripping Arizona gravel deposits	650,000	cu.yd.	0.10	65,000	0.20	130,000	0.55	357,500
	Total				$48,890,995.50		$53,893,878.70		$58,653,107.50

Lateral Sewers at Freeport, N. Y.

CONTRACT was let in January, 1931, for 12 miles of 8- and 10-in. vitrified tile pipe for lateral sewer district No. 2, Freeport, N. Y., for $174,685. Included in the contract is a half-mile of 8-in. cast-iron pipe for protecting water-supply fields. The lateral sewers will drain into existing trunk lines, and in part into lateral sewers.

Specifications require that the trench be kept dry. Soil is sandy with sufficient water, probably, to require well-points. Most of the trench is 8 to 10 ft. deep. Vitrified pipe joints are closed with bituminous compound, the cast-iron pipe with lead.

Unit prices are given of the lowest four bids: A, John Mateicciani, 805 Lloyd St., Chester, Pa.; B, Spinielo Construction Co., Inc., 24 Middle Neck Rd., Great Neck (contract); C, Kennedy & Smith, Inc., Bradford Ave. and Henry St., Flushing; D, L. R. Gilbert, Inc., 7 Watchung Ave., Plainfield, N. J.

	A	B	C	D
2,170 ft. 8 in. v.t.—0-6 ft.	$1.00	$0.95	$1.77	$1.20
49,480 ft. 8 in. v.t.—6-8 ft.	1.05	1.18	1.78	1.30
5,160 ft. 8 in. v.t.—8-10 ft.	1.10	1.35	1.89	1.80
100 ft. 8 in. v.t.—6-8 ft.	1.20	1.17	1.82	1.60
860 ft. 8 in. v.t.—8-10 ft.	1.30	1.55	1.92	1.80
2,800 ft. 8 in. c.i.—6-8 ft.	2.00	1.60	2.75	2.10
100 ft. 5 in. v.t. h.l. ris.	1.00	1.50	.50	1.50
10,000 ft. 5 in. v.t. h.l.	.75	1.05	.35	1.40
20,000 ft. 5 in. c.i. h.l.	.95	1.25	.74	1.60
30 m.f.b.ft. lumber	45.00	30.00	60.00	50.00
200 ft. piles	.60	.75	2.00	.75
20 cu.yd. conc.—A—(1:2:4)	12.00	11.00	15.00	22.00
50 cu.yd. conc.—B—(1:3:5)	10.00	10.00	14.00	18.00
1,000 lb. reinf. steel	.10	.05	.05	.10
20 cu.yd. mas-rock excav.	4.00	2.00	10.00	1.00
20 cu.yd. mas. excav. special	4.00	4.00	5.00	5.00
150 cu.yd. add. excav.	2.00	2.00	2.00	2.50
500 lin.ft. conc. pav. repl.	1.50	1.70	1.10	2.00
500 sq.ft. conc. pav. add.	.35	.32	.30	1.00
14,000 lin.ft. asph. pav repl.	1.60	1.75	.92	1.00
10,000 sq.ft. asph. pav. add.	.45	.40	.28	.15
4,000 lin.ft. mac. pav. repl.	.70	1.25	.72	.40
2,000 sq.ft. mac. pav. add.	.20	.30	.22	.10
6,000 lin.ft. sidewalk repl.	1.00	1.00	1.00	1.00
6,000 sq.ft. sidewalk add.	.30	.25	.25	.25
80 lin ft. curb repl.	1.00	1.00	1.25	1.00
Total	$155,609	$174,685	$182,366	$189,700

CONSTRUCTION NEWS

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WATERWORKS

PROPOSED WORK

Calif., Burlingame and Hillsborough—Unified water system, incl. improvements, extensions to present systems, new reservoirs in each city. $595,865. C. C. Kennedy, Call Bldg., San Francisco, engr.

Mass., Lowell—City, Water Dpt., City Hall, altering and constructing 1 story, brick addition to pumping station, West 6th St. $40,000.

Mass., Weymouth—Town, Bd. Selectmen, waterworks improvements, extensions. $93,600 appropriated.

Mass., Wrentham—Town, Bd. Selectmen, extending waterworks, and hys. $20,000 appropriated.

Minn., Redwood Falls—Soon takes bids 200,000 gal. reservoir, pump house and equipment, softening plant. To exceed $15,000. L. P. Wolff, 903 Globe Bldg., St. Paul, cons. engr. Noted Mar. 5.

N. J., Matawan—Twp. Comn., Township Hall, mains in Ravine Gardens section, Barrett property and Middlesex St. $15,000. **Maturity probably soon.** Engineer not selected.

N. J., Oakland—Bd. Boro Council, Boro Hall, bids in May, water supply, driving wells on Lake and Franklin Aves., laying mains for diverting 250,000 gal. water daily. $15,000 or more. J. M. Demarest, boro engr. Noted Feb. 26.

N. Y., Canajoharie—Bd. Trustees, repairing waterworks by replacing wooden pipe with iron pipe. $125,000.

N. Y., Long Island City—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., New York, filtration plant, Underhill Ave. and Fresh Meadow Lane. $40,000. Private plans. J. J. Dietz, comr.

N. Y., Syracuse—City new intake pipe line at Skaneatles Lake. $300,000. W. W. Cronin, State Tower Bldg., engr.

Tex., Kilgore—Complete waterworks and sewerage systems. F. J. Von Zuben, 802 Fair Bldg., Fort Worth, consult. engr. Noted Feb. 26.

Ont., London — Utilities Comn., E. V. Buchanan, genl. mgr., watermains. $100,000.

Ont., Ottawa—City, Secretary Bd. Control, soon takes bids 3 electric pumping units, 17 m.g.d.c. each, 400 hp. diesel oil engine capable of working pumps to 35 m.g.d.c. F. C. Askwith, City Hall, engr.

Ont., Toronto—Reconditioning waterworks incl. new 6 in. and up, c.i. mains, additional mains, valves, hydrants, services, at the Island. $330,000. R. C. Harris, City Hall, engr.

Ont., Westboro—Nepean Twp., c/o J. Gamble, clk., soon takes bid mains in Water Area 1. $75,000.

BIDS ASKED

Calif., Oceanside—Mar. 25, by J. H. Landes city clk., furnishing 16 in. recording, main line, or current water meters metre, installing 16 in. riveted steel pump discharge pipe line.

Calif., San Luis Obispo—Mar. 25, by Property & Disbursing Office, 128 State Capitol Bldg., Sacramento, furnishing, installing 12,000 ft. 4, 6 and 10 in. c.i. pipe, one 10 and one 6 in. gate valves, at National Guard Training Camp.

Mass., Townsend—See "Contracts Awarded."

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	*Project*	*Cost*	*Status*
Sewers			
Chicago	Sewers	$2,924,938	Contract
Bridges			
St. Louis	Bridge approaches	1,190,000	Bids asked
New Jersey	Viaduct	2,522,070	Contract
Grade Crossings			
Mansfield (Mass.)	Grade elimination	2,000,000	Proposed
Power and Lighting			
Chicago	Street lighting	1,613,000	Contract
New York	Transmission lines	10,000,000	Proposed
Subways and Tunnels			
Boston	Traffic tunnel	5,696,510	Contract
Montreal	Subway	3,000,000	Proposed
Pipe Lines			
Colorado and Kansas	Gas pipe line	2,000,000	Proposed
Montana	Gas pipe line	12,000,000	Contract
Texas	Pipe line	1,000,000	Proposed
Unclassified			
Kansas City (Mo.)	Grain elevator	1,000,000	Contract
Federal Government			
Sacramento	Post office	1,300,000	Proposed
Washington	Office	4,000,000	Proposed
Vincennes (Ind.)	Memorial	1,500,000	Proposed
Springfield	Post office	1,750,000	Contract
Las Vegas (Nev.)	Hoover Dam	48,890,995	Contract
Newark (N.J.)	Post office	6,150,000	Proposed
New York	Post office	5,000,000	Proposed
Seattle	Hospital	2,000,000	Proposed
Factories and Mills			
Oakland (Calif.)	Glass factory	1,000,000	Proposed
Burnaby (B.C.)	Assembling plant	1,000,000	Proposed
Copper Cliffe (Ont.)	Metals separation plant	1,000,000	Contract
Warehouses			
New York	Freight terminal	15,000,000	Proposed
Buildings			
Hamilton (Ont.)	Hotel	1,000,000	Contract
Montreal	Hospital	1,000,000	Proposed
St. Louis	Office	2,500,000	Proposed
New York	Office	6,000,000	Proposed
New York	Office	1,200,000	Proposed
Galveston	Office	1,000,000	Contract
Worcester (Mass.)	Auditorium	2,000,000	Proposed
New Haven	University	2,500,000	Contract
Boston	School	1,000,000	Proposed
Toronto (Ont.)	Merchandise Mart	3,000,000	Proposed
Newark (N.J.)	Theatre	1,000,000	Proposed
Cincinnati	Passenger station	5,000,000	Bids asked
Saratoga Spr. (N.Y.)	Laboratory, etc	2,375,000	Proposed

Calif., Sonoma—Mar. 23, by H. W. Gottenberg, city clk., furnishing, installing pumping system for city plaza, incl. 100 g.p.m. pump, when pumped into 550 gal. pneumatic California Code Tank, with water pressure and gage openings for pump connections and drain against 40 lb. Industrial Control two-pole pressure control, equipped with Standard make, 220 volt, 3 phase, 60 cycle roller or ball bearing motor, c.i. case and cover plate, mounted on c.i. base with raised edges to catch drip, pump direct connected to electric motor by flexible coupling.

D. C., Wash.—Mar. 23, by District Comrs., 282 ft. 30 in., 3,755 ft. 36 in. and 2,450 ft. 48 in. concrete or cast iron mains; adv. E. N.-R. Mar. 19.

Ill., Park Ridge—Village, bids about Mar. 24, 21 in. c.i. water pipe. $36,000. C. DeLeuw & Co., 111 West Washington St., Chicago, engr.

Mass., Springfield—Apr. 14, by Bd. Water-Comrs., covered concrete reservoir. Contr. 15. E. E. Lochridge, Springfield, ch. engr. Hazen & Everett, 25 West 43rd St., New York, consult. engrs.; adv. E.N.-R. Mar. 19.

N. Y., Brooklyn—Mar. 24, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains, appurtenances, and transferring taps in Bay Ridge Parkway, 10th and 11th Aves., 70th, 71st, 72nd, 74th and 77th Sts.; mains in Fort Hamilton Parkway, Sea View and 20th Aves., Ferris, Sackett, Van Brunt, 83rd, 85th, East 48th and Beach 51st Sts.

N. Y., Middletown—Apr. 13, by Clerk of Common Council, City Hall, 16 James St., c.i. pipe, special castings. Fuller & McClintock, 170 Bway., New York, and Pennsylvania Bldg., 42 South 15th St., Phila., Pa., engrs.; adv. E. N.-R. Mar. 19.

N. Y., New York—Mar. 24, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., removing and resetting low and high pressure hydrants and appurtenances, in Essex, East Houston, and West Houston Sts.

Pa., Avella—See "Contracts Awarded."

Tex., Galveston—Takings bids waterworks, incl. new pump. City Engr. Dpt., c/o O. E. Casey, comr., engrs.

Tex., Point Isabel — City Comrs. and H. E. Elrod, engr., Petroleum Bldg., Houston, bids about Mar. 28, waterworks, incl. large distributing system, pumping unit. $75,000. Noted Mar. 5.

Utah, Logan—See "Contracts Awarded."

Ont., London—Apr. 15, by Public Utilities Comn., E. V. Buchanan, genl. mgr., two 2,000,000 Imperial gal. daily capacity, waterworks pumps, electrically driven.

CONTRACTS AWARDED

Calif., Los Angeles—Los Angeles Co., driving exploration tunnels for San Gabriel Dam, to C. Henrietta, 2400 Blanche St., Dam 2 $5,200, Dam 3 $4,450.

Calif., Orange—Bd. Directors Serrano Irrigation Dist., et al., Santiago Creek Earth Rolled Fill Dam, to R. G. Le Tourneau, 122 Moss Ave., Stockton, $503,000. Noted Feb. 19.

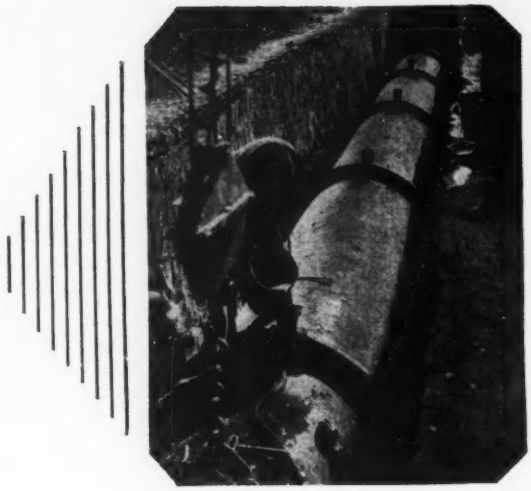
Ill., Chicago—Bd. Local Impvts., City Hall, water service pipes in Ashland, Oconto, Octavia, Odell and Oketo Aves., to P. J. Collins Co., 5521 Bway., $22,598; South Kedzie, South Oakley, South Latrobe, South Lockwood, South Laurel and South Long Aves., to G. D. Hardin, 3139 Indiana Ave., $12,750; Woodlawn, South Keating, South Kilpatrick and South Knox Ave., to Reliance Plumbing Co., 2430 West Van Buren St., $13,015; Beverly and South Ashland Ave.,

See proposal advertising on page 117

Const. News page 111

LEADITE

Trade Mark Registered U.S. Pat. Office



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LEADITE saves Time and Money, all along the line—for instance: It is light and easy to ship and handle on the job. It melts at a comparatively low temperature. It pours easily and freely, and can be handled by unskilled labor. Long experience has proven that it improves with age. It has been successfully used under conditions of expansion, contraction, vibration and deflection. It requires no laborious caulking. It makes a good, tight joint. It is always uniform in Quality and Quantity—and, most important of all, it has been time tried and tested for over a quarter century—and thousands of miles of bell and spigot pipe are jointed with LEADITE.

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

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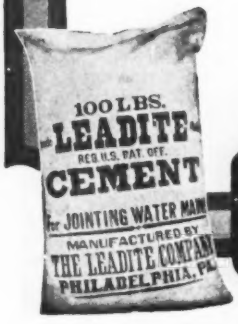

No Caulking

Waterworks (Continued)

to **Washington Plumbing & Heating Co.**, 461 North Halsted St., $3,090; Osceola, Olcott, Orleander and Oriole Ave., to Walsh & Metzger, Inc., 6828 South Chicago Ave. $21,344. Grand total $72,797.

Md., Baltimore — Bd. Awards, E. G. Rost, water engr., Municipal Bldg., furnishing, delivering c.i. pipe, fittings to Bureau Water Supply, to R. D. Wood & Co., 400 Chestnut St., Phila., Pa., $220,599. Noted Feb. 19, under "Materials."

Mass., Pembroke—Bd. Water Comrs., c/o Fay, Spofford & Thorndike, engrs., 44 School St., Boston, waterworks. Contr. 1, Items 1, 2 and 3, to Herbert Kennedy Co., Inc., 122 East 42nd St., New York, $66,907; Contr. 2, c.i. bell spigot pipe joints, gate valves, valve boxes, hydrants, to Chapman Valve Mfg. Co., 71 A St., Boston, est. exceeds $15,000; Contr. 3, c.i. spigot pipe joints, gate valves, valve boxes, hydrants, etc., to Columbian Iron Works, 2501 Chestnut St., Chattanooga, Tenn., est. exceeds $15,000. Noted Feb. 5.

Mass., Townsend—Town, Bd. Selectmen, waterworks, dams at various water holes, constructing roadways, day labor, $15,000 or more. Noted Mar. 5.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in New York and Utica Aves., to Atlas Water Works Corp., 6053 Huxley Ave., New York, $71,333. Noted Mar. 5.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricty, Municipal Bldg., New York, mains in Ash, Barclay Sts., to Ozone Park Water Pipe Constr. Co., 96-29 Rockaway Blvd., Ozone Park, $18,600. Noted Mar. 5.

N. Y., Long Island City—J. J. Dietz., comr. Water Supply, Gas & Electricty, Municipal Bldg., set pressure valves Rockaway and Woodhaven Blvds., to Beaver Eng. & Contg. Co., 51 Chamber St., New York, $14,407. Noted Feb. 25.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., valves., mains, to Gregory Contg. Co., 73049 Grand Ave., Maspeth, $98,880; setting additional valves, to Bronx Water Works Co., 1 Riverdale Ave., $4,298; installing steam line Milburn Ave. Pumping Station, Baldwin, to F. N. Lewis Co., Inc., 136 Liberty St., $8,000. Grand total $111,178. Noted Mar. 5.

Pa., Avella—Avella Water Co. reservoir to supply water for washing plant of Pittsburgh Terminal Coal Co., separate contracts. To exceed $15,000.

Tex., Wharton — At office City Secretary, waterworks improvements, drilling new well, installing new pump to Layne-Texas Co., 2nd Natl. Bank Bldg., Houston, $11,525; constructing and furnishing materials for 300,00 gal. steel tank and tower, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., $16,950; constructing tank and tower foundation, to J. E. Joplin, Wharton, $1,590. Grand total $30,065. Noted Feb. 19.

Utah, Logan—City Council, 3,800 ft. welded steel pipe, to Burnham Mfg. Co., Woods Cross, $16,180; installation of same, day labor. Est. $25,000. Noted Feb. 16 Daily.

Ont., London—City, constructing 18 in. watermains, day labor, under supervision City Engineer Near. Est. $100,000. Contract for piping, to Gartshore Thompson Co., Hamilton.

Que., Lachine—H. Daoust, Esq., city clk., City Hall, 4 story, brick, stone filtration plant, 6,600,000 gal. capacity, St. Joseph St. between 34th and 36th Aves., to A. F. Byers & Co., 1226 University St., Montreal, $142,000. Noted Feb. 12.

Que., Montreal—Laying water mains along Lachine Canal, to Laurin Leitch Co. Ltd., 2076 Union St., $170,000.

SEWERS

PROPOSED WORK

Calif., Redwood City—Bd. Supervs. will not take bids Mar. 16, outfall sewer for San Bruno, Lomita Park and Capuchino (into San Francisco Bay) Project temporarily deferred due to protests on financing method. $100,000. R. A. Klassen, Court House, engr. Noted Mar. 5.

Conn., New Canaan—Boro. extending sewers. $115,000 bond issue authorized.

Ind., Berne — Town Council sewage disposal plant. $90,000.

Ind., Seymour—City Council bids during April, sanitary sewer, 3rd and Laurel Sts. $80,000. A. Mather, Seymour, engr.

N. J., Ocean City — Bd. City Comrs., City Hall, bids probably in April, extending sanitary sewerage system to Bayonne Pl., 16th, 17th and 18th Sts. $25,000. W. H. Collisson, Jr., city engr. Noted Mar. 12.

N. J., West New York—Bd. City Council, widening, extending, sewers, mains, grading Bway. north of 23rd St. to Guttenburg. $98,000. Project in abeyance. F. Oleri, 950 Bergenline Ave., town engr. Noted Feb. 12.

O., Delphos—City sewage treatment plant. $100,000. G. A. Reese, Clark Bldg., Canton, engr. Noted Feb. 12.

Pa., South Williamsport — Soon takes bids sanitary sewer, laterals, manholes, connections in Howard St., West 7th and West Central Aves. Est. exceeds $25,000. W. C. Strayer, 332 Lowe St., engr.

R. I., Newport—City, sewerage system, Sect. 2, incl. 2 pumping stations, 1 ejector station, pipe, manholes, settling tank, Broadway and Spring St. $185,000. J. A. Openshaw, City Hall, comr. P. Wks.

S. D., Sioux Falls — City, G. W. Burnside, mayor, service connecting sewers in Dakota and Main Aves.; water service connections from watermains in Dakota Ave.

Tex., Austin—City, c/o A. R. Johnson mgr., postponed bids to have been opened Mar. 11 for about 30 days, 36,000 ft. 6 in. and 1,550 ft. 8 in. sanitary sewers, 90 manholes. $50,000. H. R. F. Helland, Austin, consult. engr.

Ont., Westboro—Nepean Twp., c/o J. Gamble, clk., Westboro, soon takes bids additional sewers, in Sewer Area "A". $50,000.

BIDS ASKED

Calif., San Francisco—Mar. 25, by S. J. Hester, secy. Bd. P. Wks., City Hall, Sect. B-15th Street Sewer, 4,000 lin.ft. 7 ft. to 3 ft. x 4 ft. 6 in. rein.-con. sewer. $125,000.

Ind., Ft. Wayne—Mar. 24, by Dpt. P. Wks., City Hall. Local Sewer Impvt. Resolution 457-1931, incl. 12 in. clay pipe vitr. sewer between Kenwood Ave. and Glazier Aves. $25,000; Main Sewer Impvt. Resolution 63-1931 "Amended," incl. pump house, 10 in. sewer pipe with appurtenances $30,000. S. C. Snyder, secy.

N. J., Newark—Mar. 26, by Essex Co. Park Comn., 115 Clifton St., storm water sewer in Branch Brook Park extension, Newark and Belleville, $25,000. J. Reynolds, 115 Clifton St., comr. Noted Dec. 18.

N. Y., Brooklyn—Mar. 25, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Delamere Pl. and Linden Blvd.

N. Y., Long Island City—Mar. 23, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in Merrick Rd., Rockaway Beach Blvd., Fisk, Betts, Bordon, 50th, Roosevelt, 115th, 107th, 83rd, Nashville, Williamson, Cronston Aves.; Price, State, Linden, 84th, 103rd, Harrow, Ingram, Grand, 239th, Liverpool, 165th, 146th, 155th, 156th, 157th, 160th, 194th, 198th, Grayson, Benton, Edmondson, Beach 32nd, Beach 139th Sts.

Tex., Galveston—City Comrs. and W. B. McGarvey, city engr., bids about Mar. 28, 1 mi. storm sewer in 33rd St. and 1 mi. sanitary sewer extensions, incl. 28- to 48-in. alternate types pipe. $100,000.

Tex., Point Isabel—City Comrs. and H. E. Elrod, engr., Petroleum Bldg., Houston and Point Isabel, bids about Mar. 28, sanitary and storm sewerage systems. $60,000. Noted Mar. 5, under "Waterworks."

Va., Richmond—Mar. 23, by City Council, R. K. Compton, dir. P. Wks., sewer work, incl. furnishing, delivering plain concrete, vitr. clay sewer pipe, sewer brick, sewer castings, steps, constructing rein.-con. ramp.

B. C., Vancouver—See "Contracts Awarded."

Que., Hull—See "Contracts Awarded."

CONTRACTS AWARDED

Ill., Chicago—Bd. Local Impvts., City Hall, drains in West 53rd Pl., West 54th St., South Sawyer, South Spaulding, South Turner, South Homan, South Latrobe, South Lockwood, South Lorel and South Long Aves., to A. Scully, 4504 Wrightwood Ave., $9,584; West 56th St., North Sacramento, South Keating, South Kilpatrick and South Knox Aves., to N. Rainieri, 5036 Montana St., $5,294; South La Crosse, South Lamon, South LaPorte and South La Vergne Aves., to M. Di Vito, 5217 South Kostner Ave., $12,240; Osceola, Olcott, Orleander and Oriole Aves., to P. Scalzitti, 2424 North Tripp Ave. $10,752; South Wabash and South Michigan Aves., to A. Santucci, 619 South Ashland Ave. $4,532. Grand total $42,402.

Ill., Chicago—Bd. Local Impvts., City Hall, M. J. Faherty, pres., system brick and tile sewers, from 24 in. tile to 11 ft. brick, manholes, catch basins, in Jonquil Terrace, 1 alley, Pratt and Ashland Blvds., Magnolia, Glenwood, North Ashland, Birchwood, Balmoral, Thorndale, Albion, Wayne, Morse, and Sherwin Aves., drains in West 53rd Pl., West 54th St., South Sawyer, South Spaulding, South Turner, South Homan, North Sacramento, South Keating, South Kilpatrick, South Knox, South LaCrosse, South Lamon, South Porte, South Levering, South Latrobe, South Lockwood, South Lorel, South Long, Osceola, Olcott, Orleander, Oriole, South Wabash and South Michigan Aves., to White Constr. Co., 1735 Fullerton Ave., $2,924,938. Noted Feb. 19.

Ill., Chicago—J. J. Sullivan, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., West Side Sewage Treatment Works, Div. BB, incl. furnishing, delivering, erecting, painting, testing special design sludge bed cleaning machine, with 81 ft. 6 in. span complete with appurtenances, to Evers, Sauvage Eng. Co., 500 North Dearborn St., $48,570. Noted Feb. 12.

Kan., Santanta—City Council, sewers, to C. L. Burt, Hutchinson, $50,508.

Md., Baltimore—Bd. Awards, sanitary sewers as listed in Sanitary Contr. 272, to Ryan Contg. Co., 1600 Walnut St., Phila., Pa., $47,552; sanitary sewers listed in Contr. 267, to W. H. Thompson Contg. Co., Relay, $37,444. Noted Feb. 19.

O., Medina — Village, new sewage disposal plant, and completing outfall sewer, to Clement Co., Medina, $89,610. Est. $101,000. Noted Feb. 26.

Pa., Hazelwood (sta. Pittsburgh)—Jones & Laughlin Steel Corp., Ross St., Pittsburgh, 42 in. concrete, terra cotta storm sewer at No. 18 Mill, to Booth & Flinn, 1942 Forbes St., Pittsburgh, est. $40,000.

Pa., Pottstown—S. J. Hester, boro pres., 4,200 ft. 36 in. sewer, to F. H. Keiser Co., 128 East 4th St., $58,464; pumping station, sewage treatment plant, to Seeds & Durham, 25 Maplewood St., Phila., $174,341; filter plant equipment, to Roberts Filter Mfg. Co., 6th and Columbia Sts., Darby, $113,640. Grand total $344,445. Noted Feb. 5.

B. C., Vancouver—Sewers in Kingsway, prior to paving and widening same, day labor, $82,800.

Que., Hull — City, new sewers, Columbia Park, etc., day labor. $141,500. T. Lanctot, $141,500. T. Lanctot, City Hall, engr.

Que., Montreal—Constructing 2nd section North End Sewer, to J. Loranger, Montreal, $373,000 plus $3.50 for rock.

WASTE DISPOSAL

PROPOSED WORK

N. J., Bloomfield—Town Council, Town Hall, preliminary plans incinerator. $25,000 or more. F. Dwyer, town engr.

Que., Quebec City—City, incinerator plant in Limoilou Ward. E. Hamel, city engr.

BRIDGES

PROPOSED WORK

Calif., San Francisco—For 240 ft. ornamental rein.-con. viaduct 135 ft. wide, 15 ft. minimum clearance, incl. two 65 ft. spans, 4,000 cu.yd. concrete, 400 tons reinforcing steel. $175,000. M. M. O'Shaughnessy, city engr.

Conn., Waterbury — City, Engineering Dpt., City Hall, preliminary plans 2 span rein.-con. bridge, Platts Mills. $155,000. R. A. Cairns, City Hall, engr.

Ind., Decatur—Bd. Comrs. Adams Co. Gallmeyer Bridge over St. Marys River, Preble Twp. $30,000.

Mass., Framingham—Town, Bd. Selectmen, new bridges, hys., and improvements. $129,500 appropriated.

Mass., Gloucester—City, Dpt. P. Wks., bridges, hy. improvements. $126,700 appropriated.

Mass., Southboro—Town, Bd. Selectmen, bridges, hys., waterworks improvements. $25,335 appropriated.

Mass., Townsend — Town, Bd. Selectmen, bridge, hy. improvements. $30,750 appropriated.

Mass., Waltham—City, Dpt. P. Wks., concrete bridge, Farrell St. $25,000. Engineer not selected.

Mass., Westwood—Town, Bd. Selectmen, bridges, hys. repairs, rebuilding Summer St. and bridge. $76,000 appropriated.

Mich., Port Huron—Bids in June, substructure and superstructure bascule type bridge over Black River, at 7th St. Waddell & Hardesty, 150 Bway., New York, engrs. Noted Dec. 4.

N. J., New Brunswick — Bd. Freeholders Middlesex Co., Court House, new steel, concrete bridge or reconstructing present bridge over Green Brook, at East Main St. $25,000. Project in abeyance. W. F. Buchanan, 280 Hobart St., Perth Amboy, co. engr. Noted Feb. 26.

Okla., Guthrie—State Hy. Dpt., Oklahoma City, 4 span 660 ft. truss bridge over Cimarron River, Logan Co., near here. $125,000. A. R. Losh, hy. engr.

Okla., Yahola—Bd. Comrs. Muskogee Co. (Muskogee) preliminary plans 12 span 1,700 ft. steel truss bridge on concrete piers over Arkansas River. $200,000. C. R. Morgan, Muskogee, engr.

Pa., Kingston (br. Wilkes-Barre) — Bids about April, steel, rein.-con. viaduct, 106 ft. wide, over Wyoming Ave., widening 1 mi. Market St. from Susquehanna River to Wyoming Ave. $248,000. R. L. Williams, Court House, Wilkes-Barre, engr.

Texas—Southern Pacific Lines (in Texas and Louisiana) R. W. Barnes, Houston, ch. engr., strengthening 2 or 3 old bridges and constructing 2 new treated timber, steel stringer bridges 200 ft. long each, between Hondo and El Paso. $150,000.

Tex., New Braunfels—City soon takes bids 3 span, rigid frame, rein.-con. bridge over Comal River. $35,000. J. Schmidt, New Braunfels, and J. W. Beretta Engineers, Inc., Natl. Bank of Commerce Bldg., San Antonio, engrs. Noted Feb. 25.

BIDS ASKED

Ala., Birmingham—Mar. 24, by A. J. Hawkins, city engr., City Hall, 750 cu.yd. earth and 700 cu.yd. rock excav., 52 sq.yd. sheet asphalt topping, 67 sq.yd. track paving, 148 lin.ft. handrail, 148 lin.ft. curb guard, 53,200 lb. steel for bridge Village Creek at 16th St. $30,000.

California — Apr. 1, by State Hy. Comn., Sacramento, four 35 ft. span rein.-con. girder bridge on concrete pile bents, concrete abutments over Carnadero Creek, 1.7 mi. south of Gilroy, also grading, concrete surfacing 0.36 mi. approaches, Santa Clara Co. — six 19 ft. timber and one 40 ft. steel beam span bridge on timber frame bents with concrete footings over Auburn Ravine, 0.5 mi. west of Auburn, Placer Co. — steel stringer overhead crossing incl. thirty-one 40 ft. spans, seven 20 ft. spans, rein.-con. deck on steel pile bents, steel frame bents on concrete footings with timber pile found., over Atchison, Topeka & Santa Fe R.R., 2.5 mi. east of Merced, also grading, concrete surfacing approaches, Merced Co. C. H. Purcell, hy. engr.

Calif., Monterey — Mar. 25, by State Hy. Comn., Sacramento, 150 ft. arch span bridge with five 25 ft. girder spans on concrete abutments, bents over Carrapata Creek, 16 mi.

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Bridges (Continued)

south of here, also grading 0.28 mi. roadway. Monterey Co. C. H. Purcell, P. Wks. Bldg., Sacramento, hy. engr.

Calif., Oakdale — Mar. 23, by Bd. Supervs. Stanislaus Co., Modesto, 390 ft. rein.-con. bridge, 24 ft. wide with 20 ft. roadway over Stanislaus River, near here. G. Macomber, Modesto, co. surv.

Georgia—Mar. 25, by J. W. Barnett, engr., East Point, widening bridge on Hawkinsville-Eastman Rd., at Bembry's Mill, Federal Aid Project 113, reopened. Pulaski Co.; constructing bridge over Atlanta, Birmingham & Coast R.R., on Douglas-Ocilla Rd., State Air Project G-9-19-C, Coffee Co.

Ill., Chicago—Mar. 25, by City, Dpt. P. Wks., City Hall, temporary approaches and single span swing bridge to detour South Halsted St. over South Branch Chicago River. $210,000. Work will start early in August permanent bridge, $2,352,000. R. W. Wolfe, comr. Noted Feb. 12.

Indiana—See "Streets and Roads."

Ia., Cherokee — Mar. 24, at office Auditor Cherokee Co., 40 x 20 ft. I-beam bridge on creosoted piling, abutments. 30 concrete culverts, extensions, placing concrete floor and creosoted substructure on present 90 x 18 ft. pony truss.

Michigan — Mar. 25, by C. A. Miller, div. bridge engr., 504 Eddy Bldg., Saginaw, FBr. 1 of 9-8-11, Contrs. 2 and 3, rein.-con. abutment, steel deck girder, Bay Co., for State Hy. Comn., Lansing.

Mo., St. Louis—Mar. 31, by Bd. P. Serv., City Hall, founds., rein.-con. piers, abutment and retaining wall, also fabricating, furnishing structural steel for East St. Louis Union Station Approach to St. Louis Municipal Bridge over Mississippi River. $1,190,000. C. E. Smith & Co., 1752 Railway Exch. Bldg., engr. Noted Dec. 4.

New Jersey—Mar. 30, by State Hy. Comn., Trenton, bridge over Atlantic City R.R., Route 42, Sect. 5, Folsom Bros., Atlantic Co.; adv. E.N.-R. Mar. 19.

New Jersey—Mar. 30, by State Hy. Comn., Trenton, 3 bridges across ship channel, Elbow and Rainbow Thorofares, Somers Point-Ocean City Crossing, Atlantic and Cape May Counties. A. L. Grover, ch. clk.

New York—Mar. 31, by A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, constructing Queens Anchorage of Triborough Bridge connecting Boros of Manhattan, Bronx and Queens.

N. Y., Buffalo—Mar. 24, by W. G. Hickman, 29 County Hall, 90 ft. span steel truss bridge, over Eighteen Mill Creek, on Bly Rd., C.R. 474, Eden. Former bids rejected. Noted Feb. 25 Daily.

Ohio—Mar. 24, by O. W. Merrell, hy. dir., Columbus, three 45 ft. span concrete beam bridge, 24 ft. roadway, Sect. "A" Washington C. H.—Greenfield Rd., Fayette Co., est. $25,502—two 25 ft. span concrete slab bridge with 36 ft. roadway Sect. "D" Lancaster-Logan Rd., Hocking Co., $16,204—two concrete slab bridges Sect. "D" Bucyrus-Tiffin Rd., Seneca Co. $4,729—24 ft. span concrete slab bridge, 44 ft. roadway, 1 sidewalk 4 ft. 6 in. wide, Sect. "B" Findlay-Upper Sandusky Rd., Wyandot Co., $10,747.

Ore., Grants Pass—Comrs. Josephine Co. bids about May 1, 90 ft. bridge on 4 concrete piers over Rogue River. J. G. Bramly, Grants Pass, co. engr.

South Dakota—Mar. 25, by State Hy. Comn., Pierre, bridges on P. 99-B and P. 266-A, Brown Co.—on P. 34-B, Spink Co.—on P. 163-Reop. Lawrence Co.—P. 150-B Reop. Fall River Co.—on P. 233-B, Haakon Co.—on P. 256-B, Pennington Co.—on P. 265-A, Lyman Co.—on P. 266-B, Brown Co. G. H. Henry, secy.

Wisconsin—Mar. 23, by State Hy. Comn. and Hy. Comn. Sauk Co., Capitol, Madison. Beth Bridge on S.T.H. 154, S.A.P. 1370—Narrow Bridge on S.T.H. 33, S.A.P. 1369—Giblin Bridge on S.T.H. 33, F.A.P. 448-B.

Ont., Cobalt—See "Contracts Awarded."

Que., Ste. Henedine—Municipalite, J. Bedard, secy.-treas., taking bids 2 steel, rein.-con. bridges over Le Bras River, one on Ste. Therese West Rd., other at Grande Ligne Rd. $55,000. Provincial Dpt. P. Wks., I. Vallee, ch. engr., Parliament Bldgs., Quebec City, prepared plans.

CONTRACTS AWARDED

Calif., Santa Rosa—State Hy. Comn., Sacramento, timber bridge over Mark West Creek, Sonoma Co., near here, to P. McHugh, 300 Valdez Ave., San Francisco, $19,366. Noted Jan. 29.

Conn., Hamden—Town, Bd. Selectmen, Town Hall, one 50 ft. rein.-con. bridge over Mill River, Skiff St., to Chas. Smith & Sons Co., 101 Water St., Derby. Noted Mar. 5.

Idaho—State Hy. Comn., Boise, 4 span 140 ft. concrete bridge over Telon River, Madison Co., to D. J. Cavanagh, Twin Falls, $20,926. Est. $23,269. $173,380.

Indiana and Illinois—Indiana State Hy. Comn. Indianapolis, J. J. Brown, dir., and Illinois Dpt. P. Wks. & Buildings, Div. Hys., Springfield, F. T. Sheets, ch. engr., open spandrel rein.-con. arch bridge with 80 ft., 145 ft., 170 ft., 180 ft., 170 ft., 145 ft., and 70 ft. spans beginning at Indiana side, 22 ft. roadway between curbs, two 5 ft. sidewalks over Wabash River, on U. S. Rd. 50 from Vincennes, Ind., to Lawrence Co., Ill., to Ferguson Constr. Co., Rockford, Ill., $257,195. Est. $375,373. Noted Jan. 1.

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Iowa — State Hy. Comn., Ames, 5 culverts, extensions, Appanoose Co. and 11 culverts, extensions, Davis Co., to E. C. Ellis, Centerville, $650 and $2,236 respectively—4 box culverts, 3 arch culverts, 2 I-beam bridges, 2 high truss bridges with I-beam approaches, Fremont Co., to A. A. Alexander & Repass Bros., 502 Frankel St., Des Moines $69,764—plate girder railroad bridge, two ft. widenalks, Lee Co., to Widell Co., Mankato, Minn., $58,256—2 I-beam bridges, 1 arch culvert, 17 box culverts, Pottawattamie Co., to C. W. Akin, Atlantic, $29,858. Grand total $160,764.

Missouri—State Hy. Bd., Jefferson City, to R. G. Aldridge, 1310 State Ave., Kansas City, Kan., bridges over Eight Mill Creek, Cass Co. $3,906; overflow East Fork 102 River, $3,631; over creek $3,731; over Blair Creek, $6,001; over East Fork 102 River, $12,489; over 102 River, $22,602; over creek, $6,269; over Harmon Branch, $6,065, all foregoing Nodaway Co.—to E. L. Markham, Cape Girardeau, over Drainage Ditch 4, $1,920; over Drainage Ditch 5, $1,945; over Drainage Ditch 6, $8,173; over Drainage Ditch 7, $7,143; over Drainage Ditch 8, $7,488, all foregoing New Madrid Co.—to H. D. Thomas, Fulton, over Messner Branch, $1,759; over branch, $2,147, Shelby Co.—and over branch, Phelps Co. $1,465—to Carte-Harlan Constr. Co., West Plains, over Huzzah Creek, Dent Co. $15,340—to W. F. Fogelman, Jefferson City, St. Genevieve Co. $23,831—to Kelly & Underwood, Granby, over Dry Branch, Jasper Co. $781—to N. Davis, Sikeston, over James River, Webster Co., $5,671. Grand total $142,-357. Noted Feb. 19.

New Jersey—State Hy. Comn., Trenton, furnishing, erecting structural steel for highway viaduct on Route 25, Connecting Link Sect. 2, Hudson Co., to American Bridge Co., 30 Church St., New York, $2,522,070. Noted Feb. 12.

New Jersey—State Hy. Comn., Trenton, 5 bridges on Route 4, Sect. 3, River Rd., Margaret St., Queens Anne Rd., Lafayette St. and Garrison Ave., Bergen Co., to Liddle & Pfeiffer, Perth Amboy, $250,623. Noted Feb. 26.

N. J., Salem—Salem Co., cantilever type bridge over Salem Creek, to Campbell & Sons, Salem, $74,472. Noted Feb. 19.

New York and New Jersey—Port of New York Authority, 80-90 8th Ave., New York, paving, railings, miscellaneous construction for main bridge and New York Anchorage Hudson River Bridge between Fort Washington, N. Y. and Fort Lee, N. J., to Corbetta Concrete Corp., McLean and Webster Aves., New York, $456,-128. Noted Feb. 5.

N. Y., Yorktown — Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, stone faced concrete bridge carrying Taconic Parkway connection over Bronx Parkway extension and 2 adjacent river bridges, Contr. 340, to Immick Co., State St., Meriden, Conn., $69,115. Noted Feb. 26.

North Carolina — State Hy. Comn., Raleigh, rein.-con. bridges, culverts on Project 7420, Forsyth Co., to Hobbs-Peabody Constr. Co., Charlotte, $29,293; Project 4363, Harnett Co., to T. A. Loving & Co., Goldsboro, $74,605. Noted Feb. 5.

O., Cincinnati—C. A. Dykstra, city mgr., City Hall, 13 span, 369 ft. concrete bridge Ida St., to Kerpen Constr. Co., Central Office Bldg., $78,-990. Est. $80,000.

Okla., Buffalo — State Hy. Dpt., Oklahoma City, 6 span 142 ft. rein.-con. bridge, Harper Co., to Ledford & Way, Walters, $17,890. Est. $25,000. Noted Feb. 19.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, rein.-con., steel bridge over Red River, Federal Aid Project 238-A, Montgomery Co., to Hickman & Long, Harriman, $72,706; 5 bridges, Federal Aid Project 231-F, Rhea Co., to Hagen-Bagley Co., Fayetteville, $68,342. Noted Mar. 5.

Texas—G. Gilchrist, state hy. engr., Austin, steel, rein.-con. bridges on hy. Guadalupe Co., to J. W. Goodrum, Seguin, $23,092 est. $34,000—3 steel, concrete bridges over Navasota River, Leon and Robertson Counties, and steel truss span on concrete piers and steel I-beam bridges over Neches River, Jasper and Tyler Counties, to Thomas & Ratliff, Rogers, $96,317 and $124,248 respectively, est. $120,000 and $140,-000 respectively—rein.-con. steel bridges, Hood Co., to L. H. Lacy Co., 202 Burt Bldg., Dallas, $115,292 est. $120,000 — rein.-con. bridges Brown Co., to L. D. Parks, Fort Worth, $26,055 est. $32,000—rein.-con. bridge, Comanche Co., to J. Floyd Malcolm & Co., Abilene, $75,422 est. $70,000—10 rein.-con. deck girder bridges, Ellis Co., to Crocker & Fisher, 803 Allen Bldg., Dallas, $160,845 est. $180,000—rein.-con. deck girder bridges Brazos Co. ,to W. W. Vann & Co., Mercedes, $78,002 est. $80,000—rein.-con., timber pile bridges, Victoria Co., to Monarch Eng. Co., Box 962, San Antonio, $44,824 est. $66,000 — rein.-con. bridges, Colorado Co., to Dozier Constr. Co., Littlefield Bldg., Austin, $26,558 est. $34,000—earth approaches and 3 steel, concrete bridges, Live Oak Co., to Sanders & Hurlburt, Three Rivers, $46,412 est. $56,000. Grand total $817,067.

Vermont—State Hy. Dpt., Montpelier, constructing 25 ft. T-beam concrete bridge and gravel approaches over Beaver Brook, Westford, and 40 ft. T-beam concrete bridge, gravel approaches, Stowe, to C. D. Noyes, Rutland, $7,695 and $12,742 respectively—two 45-ft. concrete T-beam bridges, concrete approaches, Pittsford, to Hayward & Nobel, Tunbridge, $18,967. Grand total $39,404. Rejected bids to have been opened Feb. 27, concrete, steel I-beam bridge, gravel approaches, Springfield. Noted Feb. 19.

Virginia—See "Streets and Roads."

Wisconsin—State Hy. Comn. and Committees of Grant, Crawford and Lafayette Counties, bridges on Cassville-North Andover Rd., to J. Johnson, Jr., Whitewater, $10,032—on Warren-Gratiot Rd., to A. R. Coffeen, Decorah, $8,898—on Mount Sterling-Ferryville Rd., to P. J. Dunlop, Mount Horeb, $25,594 — Shullsburg-Hick's Corners and Darlington-Lamont Rds. to Lewis Teasdale, Platteville, $3,115—on Boscobel-Readstown Rd., to Herbert Turner & Son, Wauzeka, $5,214—on Hazzards Corners-Darlington Rd., and Stavers Corners-Belmont Rd., to S. Swenson, Mount Horeb, $17,387. Grand total $70,240. Noted Feb. 26.

Ont., Cobalt—C. H. Fullerton, deputy minister Dpt. Northern Development, Parliament Bldgs., Toronto, steel work for one 80 ft. and ten 30 ft. span overhead bridge on concrete abutments, piers, Lang St., to Dominion Bridge Co. Ltd., 1139 Shaw St., Toronto, $10,240; other work being done by day labor. Total est. $70,000. Noted Feb. 5.

STREETS AND ROADS

BIDS ASKED

Arizona—Mar. 23, by State Hy. Comn., Phoenix, grading, draining, 5.5 mi. Holbrook-St. John Hy. from Holbrook to Phoenix-Tempe Hy. and approaches at Tempe Bridge, Navajo and Maricopa Counties. W. W. Lane, state hy. engr.

California — Apr. 1, by State Hy. Comn., Sacramento, grading, crushed run base surfacing 3.5 mi., bituminous macadam surfacing 6.5 mi. road between Waterman Switch-back and Saratoga Gap, Santa Cruz Co.—grading, concrete surfacing 3.7 mi. road between Wigmore and Los Alamos, Santa Barbara Co.—1.5 mi. at Bostina, San Diego Co. C. H. Purcell, hy. engr.

Calif., Culver City—Mar. 23, by J. Jarrett, city clk., grading, curbing, sidewalks, 2 in. warrenite on 6 in. asphaltic concrete surfacing 475,000 sq.ft. and 2 in. warrenite on 6 in. concrete surfacing 428,000 sq.yd. Sepulveda Blvd. between Venice Blvd. and city limits. Former bids rejected. Noted Feb. 5.

Calif, Laguna Beach—G. W. Prior, city clk., received no bids Mar. 4, grading, curbing, sidewalks, street lighting system, 5 and 6 in. asphaltic concrete paving 114,000 sq.ft. Ocean Ave. Will probably take new bids.

Calif., Long Beach—Mar. 24, by City Council, curbing, guttering, sidewalks, storm drains, 8 in. vitr. sewers, 6 in. concrete paving 125,000 sq.ft. Ocean Ave. between Termino and 52nd Sts.

Calif., Salina—Bd. Comrs. Monterey Co. taking bids improving Necimento Rd., incl. 47,-569 cu.yd. excav., 328 ft. 12 in., 232 ft. 15 in. and 90 ft. 24 in. corrugated iron pipe.

Calif., San Gabriel—Mar. 24, by I. H. Stouffer, city clk., curbing, 4 in. warrenite surfacing 100,330 sq.ft. Hermosa Dr.

Conn., Hartford—Mar. 24, by Bd. Contr. & Supply, excavating, sub-grading, concrete paving 3,560 sq.yd. airport runways at Brainard Field. $25,000. R. N. Clark, City Hall, engr.

Georgia—Mar. 25, by J. W. Barnett, engr., East Point, concrete paving 8.2 mi. Eatonton-Madison Rd., Federal Air Project 409 reopened and 477-A, Putnam Co.; grading, 4 bridge culverts, concrete paving 4.8 mi. Statesboro-Savannah Rd., Federal Aid Project 207-B, Effingham Co.

Idaho—Mar. 24, by A. Harbour, comr. P. Wks., Boise, grading, crushed graveling 5.001 mi. Yellowstone Park Hy. from St. Anthony south in Fremont Co.—6.01 mi. Old Oregon Trail (Southern Branch) between Notus and Parma, Canyon Co.—grading, crushed graveling, crushed rock surfacing 11.277 mi. Lewis and Clark Hy., between Lenore and Orofino, Nez Perce and Clearwater Counties—9.671 mi. Lewis and Clark Hy. between Myrtle and Lenore, Nez Perce Co.

Indiana—Mar. 31, by State Hy. Dpt., Indianapolis (**F.A.P. means Federal Aid Project and S.R. State Road**) concrete, bituminous concrete or brick surfacing 4.788 mi. Bloomfield-Bedford Rd., S.R. 54, F.A.P. 161-C, Lawrence Co.—2.009 mi. Westfield-Peru Rd., S.R. 31, F.A.P. 232-233, Howard Co.—8.812 mi. Rockville-Danville Rd., S.R. 36, F.A.P. 237-A, Parke Co.—9.139 mi. Rockville-Danville Rd., S.R. 36, F.A.P. 237-B, Parke and Putnam Counties—11.158 mi. Winamac-Loganspport Rd., S.R. 29, F.A.P. 238-A, Pulaski and Cass Counties—5.706 mi. Ft. Wayne-Hicksville Rd., S.R. 14, F.A.P. 240, Allen Co.—2.732 mi. Marion-Wabash Rd., S.R. 15, F.A.P. 253, Grant Co. State will furnish all cement—grading 3.162 mi. bridge approaches Henderson, Ky.-Evansville, Ind. Bridge, S.R. 41, F.A.P. 200, incl. constructing structures 20 ft. clear span or under on above project. J. J. Brown, dir.

Ind., Bluffton—Mar. 28, by Bd. Comrs. Wells Co., stone surfacing 5.300 ft. E. Bauermeister Rd., and 5,280 ft. H. Franke Rd. $31,450. P. Scott, Bluffton, aud.

Ind., Crawfordsville — See "Contracts Awarded."

Ind., Indianapolis—Mar. 23, by Dpt. P. Wks., City Hall, grading lawns, grading, 6 in. concrete paving sidewalks Colorado and Somerset Aves.—grading, curbing, gravel surfacing Weaver Ave.—grading, brick asphalt, asphaltic concrete, concrete on 6 in. concrete, or one-course 8 in. concrete surfacing Colorado Ave.—12 in. vitr. clay or machine-made concrete sewer in First Alley east of Bellevue Pl.

Streets and Roads (Continued)

Ind., Indianapolis—Mar. 30, by Bd. Comrs. Marion Co., improving 2.534 mi. Spring Mill Rd. $76,934: Bridge 34, over 20 ft. span, $22,-568. B. Short, Indianapolis, engr.

Ia., Ft. Madison—See "Materials."

Ia., Marshalltown—Mar. 24, at office Auditor Marshall Co., gravel surfacing 12.5 mi. secondary roads, also 7,114 lin.ft. culvert pipe.

Ia., Northwood—Mar. 23, at office Auditor Worth Co., grading 7 mi. trunk roads, 17.4 mi. local roads. J. T. Teall, Northwood, co. engr.

Ia., Rock Rapids—Mar. 24, at office Auditor Lyon Co. grading, incidental work 16.5 mi. local roads.

Ia., Sioux City—Apr. 3, by E. V. Moone, city clk., concrete paving 7 blocks West 6th St., Williams and Ridge Aves., 30 ft., $44,500. L. Hintgen, City Hall, engr.

Kansas—Apr. 3, by State Hy. Comm., Court House, Paola, grading, culverts, concrete paving 8.299 mi. Project 7-15 and 16, Federal Aid Project 293-C, Miami Co. W. V. Buck, Topeka, hy. engr.

Kentucky—Mar. 25, by State Hy. Dpt., Frankfort, clearing, grubbing, grading, shaping, drainage structures, traffic bound limestone, crushed limestone, waterbound macadam or creek gravel surfacing 4.313 mi. Bowling Green-Scottsville Rd., Federal Aid Project 228-A-GS, Allen Co. B. Johnson, chn.

La., Bastrop—Apr. 7, by J. L. White, engr., Bastrop, furnishing material, constructing 2 mi. Project 6 from point 6.5 mi. west of Bastrop, to Ouachita River — 3.5 mi. Project 7 from point 4 mi. south of Bonita to point 3 mi. east of Gallion—1 mi. Project 8, Zachary Bridge Rd., for Morehouse Co.

Maryland—Mar. 24, by State Roads Comm., Baltimore, G. C. Uhl, chn., sheet asphalt paving 0.74 mi. Contr. BC-102-74, Baltimore City—concrete shoulders 0.6 mi. BC-100-74 Baltimore City—rock asphalt or bituminous concrete paving 2.99 mi. Contr. B-189-711, Federal Aid Project 223, Baltimore Co.—concrete paving 2 mi. Contr. Co-65-24, Caroline Co.—1.7 mi. Contr. D-75-14, Dorchester Co.—1 mi. Contr. P-162-32, Prince Georges Co.: adv. E. N.-R. Mar. 19.

Md., Baltimore—Mar. 26, by Bd. Awards, concrete paving 10,950 sq.yd. streets listed in Contr. 590; sheet asphalt paving 8,100 sq.yd. streets listed in Contr. 591. N. L. Smith, Municipal Bldg., hys. engr.

Mass., Medfield—See "Contracts Awarded."

Mass., Saugus—See "Contracts Awarded."

Michigan — Mar. 25, by E. R. Benkert, resident engr., Port Huron, grading, shaping, drainage structures, concrete paving 4.692 mi. FO32-31, Contr. 4, Huron Co., for State Hy. Comm., Lansing.

Mo., St. Louis—Mar. 24, by Bd. P. Serv., City Hall, grading, concrete paving 33,400 sq.yd. alleys in City Blocks 463E, 1578, 1647, 3034, 4040, 4078, 4346S, 4383SB, 4403AW, 5389, 5404E, 5549, 5695, 5834, 5904, 5929, 5921, 5972 and 6134, $65,070. W. W. Horner, city engr.

Mo., St. Louis—Mar. 31, by Bd. P. Serv., City Hall, granite curbing, vibrolithic concrete paving 2,855 sq.yd. Dunnica Ave., $12,925—770 sq.yd. Glasgow Ave., $6,160—asphaltic concrete paving 2,445 sq.yd. Mardel Ave., $18,600—1,485 sq.yd. Robert Ave., $12,840—asphalt paving 1,535 sq.yd. Robert Ave., $13,-040—1,545 sq.yd. Nashville Ave., $10,280—3,625 sq.yd. Ulena St., $23,200— warrenite bitulithic paving 3,460 sq.yd. Iowa Ave., $25,-640— amiesite paving Macklind Ave., $39,640 W. W. Horner, city engr.

Nevada—Mar. 25, by Directions Dpt. Hys., Carson City, grading, crushed rock or gravel surfacing 66,900 cu.yd. state hy. from Dutch Creek to Schurz, Routes 3 and 1-A, Sects. E, F and B, Mineral Co.—51,700 cu.yd. state hy. between point 5 mi. east Holbrook and point 2 mi. north Carter's and 4 mi. south of Gardnerville and Gardnerville, Route 3, Sects. A2, B1 and B2, Douglas Co. S. C. Durkee, state hy. engr.

New Jersey—Mar. 30, by State Hy. Comm., Trenton, grading, 9 in. rein.-con. paving 1.14 mi. Route S-1, Sect. 1, Bergen Co. A. L. Grover, ch. clk.; adv. E. N.-R. Mar. 19.

N. J., Mountain Lake—Mar. 24, by Mayor and Boro Council, Boro Hall, 2 Boulevard W., bituminous penetration paving 6,100 lin.ft. Laurel Hill Rd. Impvt. and 2,450 lin.ft. Addington-Laurel Hill Impvt. F. T. Rubidge, boro engr.

N. J., North Plainfield—Apr. 3, by Common Council, paving Pearl St., between Somerset St. and Watchung Ave. $40,000.

N. J., Ocean City—Apr. 1, by Bd. Freeholders Cape May Co., Court House, Cape May, concrete paving Ocean City-Strathmere Rd. from 55th to 34th Sts.; adv. E.N.-R. Mar. 19.

N. J., Salem—Apr. 6, by Road Com. Bd. Freeholders, Salem Co., Court House, furnishing, applying 392,352 gal. slow curing asphaltic oil and 9,711 cu.yd. sand gravel on various roads. H. B. Keasbey, 90 Market St., co. engr.; adv. E. N.-R. Mar. 19.

New York—Mar. 30, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, grading, paving 2.16 mi. Cross County Parkway from Broad St. Viaduct to Hutchinson River Parkway, J. Downer, ch. engr.; adv. E. N.-R. Mar. 19.

New York—Apr. 7, by A. W. Brandt, comr. Hys., Albany, constructing hys. in Cattaraugus, Clinton, Delaware, Yates and Ontario Counties; reconstructing hys. in Columbia, Fulton, Oneida, Ontario, Orange, Schoharie and Ulster Counties; adv. E. N.-R. Mar. 19.

New York—Apr. 10, by A. W. Brandt, comr. Hys., Albany, constructing hys. in Erie and Westchester Counties; reconstructing hys. in Allegany, Chemung, Delaware, Schoharie, Livingston, Nassau, Onondaga, Madison, Ontario, Suffolk, and Ulster Counties; adv. E. N.-R. Mar. 19.

N. Y., Brooklyn—Mar. 25, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, grading, curbing, flagging Avenue Y, Hegeman and Grant Aves., 15th and East 49th Sts.—grading, preliminary bituminous macadam paving East 89th St.—grading, curbing, asphalt on 6 in. concrete paving Avenues T and J, Wyckoff and Louisiana Aves., Hawthorne, West 3rd Sts.—grading, sidewalks on Ridge Blvd.

N. Y., New York—Mar. 23, by S. Levy, pres. Manhattan Boro, Municipal Bldg., sheet asphalt on concrete paving Wall, 204th, and East 56th Sts.; widening, granite on concrete repaving East 73rd, East 62nd, Greene, West and East 13th Sts.

N. Y., New York—Mar. 24, by W. J. Flynn, acting pres. Bronx Boro, Crotona Park grading, curbing, sidewalks, sheet asphalt on concrete paving West 233rd, East 173rd, and East 211th Sts.—grading, culverts, drains, receiving basins in Pelham Parkway, Harper Ave.—sewers in Ely and Kingsland Aves.

Ohio—Mar. 24, by O. W. Merrell, dir. hys., Columbus, concrete slab widening 1,851 mi. Sect. "A" Mansfield-Ashland Rd., Ashland Co., 30 ft., $67,352—waterbound macadam paving 1.374 mi. Sect. "S" Washington C.H.-Greenfield Rd., Fayette Co., 20 ft., $27,423—paving 6.088 mi. Sect. "B" Findlay-Tiffin Rd., Hancock Co., 20 ft., concrete $157,663, tar macadam $123,-809—rein.-con. widening 0.957 mi. Sect. "M" Cincinnati-Chillicothe Rd., Hamilton Co., $59,214—brick paving 0.397 mi. Sect. "Hillsboro" Highland Co., 30 ft., $25,759—tar macadam paving 1.204 mi. Sect. "A-1" Canfield-Niles Rd., Mahoning Co., 20 ft., $28,089—1.761 mi. Sect. "F" and "D" Logan-Lancaster Rd., Hocking Co., 20 ft., $62,444—grading, macadam paving 0.319 mi. Sect. "B-2" Millersburg-Wooster Rd., Holmes Co., 20 ft., $14,010—paving 1.017 mi. Sect. "Woodsfield" Woodsfield-Barnesville Rd., Monroe Co., 30 ft., bitulithic concrete $46,100, concrete $41,650—0.805 mi. Sect. "Woodsfield" Woodsfield-Caldwell Rd., Monroe Co., 30 ft., bitulithic concrete $95,214, concrete $100,759—brick on concrete paving 2.417 mi. Sect. "M" and others, Dayton-Troy Rd., Montgomery Co., 20 ft., $65,841—paving 4.478 mi. Sects. "B" and "D" Bono-Port Clinton Rd., Ottawa Co., 20 ft., bituminous macadam $135,345, concrete $133,593—8.366 mi. Sects. "L" and "M" Van Wert-Celina Rd., Van Wert Co., 20 ft., bituminous macadam $244,878, concrete $244,725—0.537 mi. Sect. "D" Findlay-Upper Sandusky Rd., Wyandot Co., 20 ft., concrete $15,161, rock asphalt $17,880.

South Dakota—Mar. 25, by State Hy. Comm., Pierre, concrete paving 17.54 mi. P. 207-B Minnehaha Co.—graveling 7.56 mi. P. 148 Dewey Co.—19,503 mi. P. 235-A Gregory Co.—19,388 mi. P. 255, Mi. Brule-Charles Mix Co.—grading, graveling 0.424 mi. P. 91-Reopened, Beadle Co.—grading, graveling, bridging 1,001 mi. P. 175-Reop., Hand Co.—grading 14.631 mi. P. 46 Reop., Hamlin Co.—10.067 mi. P. 233-B, Haakon Co.—3.875 mi. P. 256-B, Pennington Co.—12.899 mi. P. 265-A, Lyman Co.—0.72 mi. Oacoma Pit, Lyman Co. G. H. Henry, secy.

Tex., Marshall—Apr. 14, by City, c/o Secretary, concrete curbing, guttering, concrete base surfacing 11,102 sq.yd. $31,195. W. C. Albright, Marshall, engr.

Tex., Turkey—Mar. 31, by City, c/o V. Fuston, secy., 6 in. concrete on 2½ in., 3 in. or 3½ in. bitulithic filled brick paving 10,262 sq.yd. Hasie Eng. Co., Court House, Memphis, engrs.

Virginia—Mar. 31, by State Hy. Dpt., Richmond (**R means Route and P. Project**) grading, drainage structures, macadam surface treating 0.4 mi. Clinch River Rd., R. 123, P. F-177-DB1 Russell Co.—1 mi. Cunningham Rd., R. 32, P. F-463-G Princess Anne Co.—1.2 mi. Wytheville Rd., R. 10, P. F-698-AB1 Wythe Co.—0.5 mi. Goldenvale Rd., R. 38, P. F-705-AB Caroline Co.—grading, drainage structures, concrete surfacing 3.95 mi. Fredericksburg Rd., R. 31, P. F-205-AWF and F-225-BW Spotsylvania Co.—grading, drainage structures, rock asphalt surfacing 4.4 mi. Ft. Story-Lynnhaven Inlet Rd., R. 500, P. F-463-G Princess Anne Co. H. G. Shirley, hy. engr.; adv. E. N.-R. Mar. 19.

Va., Richmond—Mar. 20 and 23, by Bd. P. Wks., R. K. Compton, dir., paving 1 alley, grading, curbing, guttering, gravel surfacing streets.

Wash., Everett—City Council bids about Apr. 10, paving, mains in Colby Ave. from Pacific to 23rd Sts. $69,589.

West Virginia — Mar. 24, by State Roads Comn., Charleston, grading, drainage structures 3.6 mi. National Forest Rd., Project 3496 Pendleton Co. E. D. Yewell, engr.

Wisconsin—Mar. 23, by State Hy. Comn. and Hy Coms. Columbia and Dodge Counties, Madison, grading, draining 6.6 mi. Endeavor-Portage Rd., F.A.P. 307; 7.37 mi. Port Washington-Fox Lake Rd., F.A.P. 444-C.

Wisconsin—Mar. 24, by State Hy. Comn. and Hy. Coms. Fond du Lac and Walworth Counties, 744 North 4th St., Milwaukee, grading, bridging, concrete paving 83,389 sq.yd. Waupun-Oshkosh Rd., both F.A.P. 463-A—115,886 sq.yd. Waupun-Oshkosh Rd., Sect. C—49,511 sq.yd. Darien-Richmond Rd., F.A.P. 464-A.

Wisconsin—Mar. 25, by State Hy. Comn. and Hy. Coms., Waushara, Wood, Marathon and Marquette Counties, Wisconsin Rapids, grading, bridging, concrete surfacing 11.164 mi. Plainfield-Wautoma Rd., Waushara Co.—10 mi. Wausau-Aniwa Rd., S.T.H. 52, S.A.P. 4608, and Eau Claire River Bridge, approaches, U. S. Hy. 51, F.A.P. 94 Reop. and 441-D, Marathon Co.—3.976 mi. County Line-Town Hall Rd., S.T.H. 13, F.A.P. 394-B, Wood Co.—grading 5 mi. Endeavor-Westfield Rd.—4.76 mi. Endeavor-Westfield Rd., option B, U. S. Hy. 51, F.A.P. 423-G, both Marquette Co.

Wisconsin—Mar. 27, by State Hy. Comn. and Hy. Coms. Ashland and Barron Counties, Superior, grading, graveling 5.42 mi. Glidden-Morse Rd., S.T. 13, F.A.P. 405-J, Ashland Co.; 5.408 mi. Cameron-Spooner Rd., U. S. Hy. 53, F.A.P. 185, Barron Co.

Wis., Fond du Lac—Apr. 3, by Fond du Lac Co., grading, draining 21.56 mi. Co. Hy. 14, MM-K-BB, P and I. J. S. McCullough, comr.

B. C., Vancouver — Bids latter part April, permanent paving 2 lines street car tracks 1 mi. Granville St. from 25th St. to 41st Ave. $200,000 incl. tracks.

CONTRACTS AWARDED

Arkansas — State Hy. Dpt., Little Rock, to Porter Constr. Co., Little Rock, grading, drainage structures 4.5 mi. Job 8151 $80,105 est. $110,000; concrete surfacing 3.5 mi. Job 8115 $65,841 est. $100,000, both Pope Co.—to Zetzler Constr. Co., Amer. Trust Bldg., Nashville, Tenn., 6 mi. Job 8154 $104,042 est. $150,000; 5 mi. Job 8153 $73,934 est. $100,000, both Conway Co.; 6 mi. Job 11040 $97,078 est. $150,000; 5.5 mi. Job 11033 $90,330 est. $130,000; 3 mi. Job 11032 $47,358 est. $70,000, all St. Francis Co.; grading, drainage structures, concrete surfacing 9.5 mi. Johnson Co. $116,447 est. $170,-000—to Merrill Eng. Co., Jackson, Miss., concrete surfacing 8 mi. Job 6124 $128,120 est. $180,000; 6 mi. Job 6146 $95,543 est. $143,-000, both Lonoke Co.—to Garrett Constr. Co., Springfield, Mo., 5.5 mi. Johnson Co. $87,767 est. $120,000; 6 mi. Pope and Conway Counties $109,501 est. $140,000 — to D. B. Hill, 115 North Spring St., Little Rock, grading, drainage structures, concrete surfacing 1.5 mi. Union Co. $19,815 est. $50,000. Grand total $1,115,881.

California — State Hy. Comm., Sacramento, grading 0.7 mi. Paxton-Keddie Rd., Plumas Co., to Morrison & Knudsen, cont., Natl. Bank Bldg., Boise, Idaho, $48,791. Noted Feb. 12.

Calif., Oakland—Grading, curbing, sidewalks, asphaltic concrete paving 8th and Fallon Sts., et al., to L. J. Immel, 1031 Evelyn St., Berkeley, $30,735. Noted Feb. 19.

Calif., Santa Ana — Orange Co., improving Santiago Blvd., incl. 15,330 lin.ft. grading, 2,000 cu.yd., gravel base and shoulders, 8,000 tons asphaltic concrete paving, to Griffith Co., Railway Bldg., Los Angeles, $31,900. Noted Feb. 19.

Colorado — State Hy. Dpt., Denver, paving 0.284 mi. railroad underpass east of Boulder near Grandview, Boulder Co., to Collier-Latimer, Inc., 1 East Bayard St., Denver, $25,599.

Idaho—State hy. Comn., Boise, grading, surfacing 11.189 mi. Boundary Co., to J. F. Konen, Lewiston, $70,214. Est. $69,643.

Idaho — A. Harbour, comr. P. Wks., Boise, graveling 6.696 mi. Sawtooth Park Hy., Cottonwood Sect., Lincoln and Blaine Counties, to Elmore Constr. Co., Mountain Home, $49,519. Est. $61,792.

Indiana—State Hy. Comn., Indianapolis, grading, drainage, structures, concrete surfacing 158,928 sq.yd. roads in Johnson Co., to Moellering Constr. Co., 241 Murray St., Ft. Wayne, $240,437 est. $288,271—76,317 sq.yd. Lake and Porter Counties, to Barnes Bros. & Co., Inc., Gary, $141,043 est. $193,907—80,766 sq.yd. Owen and Monroe Counties, to Calumet Paving Co., Gary, $128,279 est. $159,014—88,014 sq.yd. Franklin and Fayette Counties, to Hinton & Smalley, Celina, O., $127,926 est. $164,-124. Grand total $637,685. Noted Feb. 12.

Ind., Auburn—Bd. Comrs. DeKalb Co., concrete surfacing 1.62 mi., re-tread surfacing 2.25 mi. Waterloo-Hamilton Rd., to R. L. Harris, State Rd., Ft. Wayne, $51,431. Est. $63,735. Noted Feb. 26.

Ind., Auburn—De Kalb Co., concrete surfacing 5.2 mi. St. Joe-Spencerville Rd., to Tri-Lakes Constr. Co., Columbia City, $94,553. Est. $135,000.

Ind., Boonville—Comrs. Warrick Co., tarvia retread surfacing 2.5 mi. Henry W. Metzger Rd., to Globe Constr. Co., West Side Bank Bldg., Evansville, $26,499. Est. $38,776. Noted Feb. 12.

Ind., Crawfordsville—City, removing railroad tracks and repaving streets, own forces, $25,000.

Ind., English—Bd. Comrs. Crawford Co., rock surfacing Edgar Jennings Rd., to I. Orwick, Center Point, $14,500. Est. $28,874. Noted Jan. 29.

Ind., Lafayette—Bd. P. Wks., concrete surfacing South 11th St., to D. Renfrow, Lafayette. Est. $25,000.

Ind., Princeton—Gibson Co., concentrate surfacing E. H. Baker Rd., to Sweet & Wright, Greencastle, $21,902; Fisher and Wolfe Rds., to R. H. Manning, Decker $13,855. Noted Feb. 19.

Iowa — State Hy. Comn., Ames, to D. R. Caldwell, Omaha, Neb., grading, drainage structures 7.134 mi. roads in Mitchell Co. $32,529—to E. J. Wilson & Son, Omaha, Neb., 0.549 mi. Mills Co. $7,544—to McDougall Constr. Co.,

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Streets and Roads (Continued)

Sioux City, gravel surfacing 6.162 mi. Adams Co. $7,687; 1.8 mi. Keokuk Co. $2,133; 15.476 mi. Taylor Co. $19,306—to Harvey Sand & Gravel Co., Harvey, 1.2 mi. Delta Stub Rd. $1,106; 4 mi. What Cheer Stub Rd., $4,032, both Keokuk Co.—to P. P. Hintoe, Oakville, 6.8 mi. Henry Co. $10,327; 240 cu.yd. riprap, 500 cu.yd. grading Van Buren Co. $1,610—to Harrison Eng. & Constr. Co., 506 Mutual Bldg., Kansas City, Mo., grading, drainage structures, paving 2.904 mi. Benton Co. $72,562; 7.305 mi. Iowa Co. $177,544 — to Bryant Paving Co., Waterloo, 6.635 mi. Black Hawk Co. $168,358—to Cameron-Joyce & Co., 170 South 8th St., Keokuk, 0.969 mi. Lee Co. $25,146—to J. H. Hartsell Early, sidewalks Dickinson Co. $4,557. Grand total $534,486.

Ia., Mason City—Cerro Gordo Co., grading 10 mi. secondary roads, to B. N. Diltz, Swaledale, $20,509. Noted Feb. 19.

Ia., Mt. Pleasant—Auditor Henry Co., grading 7.531 mi. secondary road, to McAndrews Constr. Co., Keokuk, $19,567.

Louisiana — State Hy. Comn., Baton Rouge, grading, drainage structures 26.3 mi. hy. Lafourche and Jefferson Parishes, to J. P. Herbert, Breaux, $87,639. Noted Feb. 10.

La., Gretna—City Council, concrete paving 2nd St from Copernicus to Lafayette Aves., and Lafayette Ave. from 1st to 11th Sts., to Hardaway Constr. Co., Columbus, Ga., $19,323; subsurface drainage work in above streets, to M. Mitchell & Sons, 323 South Saratoga St., New Orleans, $22,155.

Maine—State Hy. Dpt., Augusta, gravel surfacing 5.01 mi. hys. in West Gardner and Gardner, to J. McCormick, 315 Taunton Ave., East Providence, R. I., $75,725—1.99 mi. Monmouth and 2.1 mi. Wales, to J. H. Kerr, Rumford, $36,570 and $31,692 respectively—5.11 mi. Palermo, to C. E. Horne, Millbury, Mass., $85,074—3.26 mi. China, to Wyman & Simpson, Inc., Augusta, $60,870—2.76 mi. Washington and Union, and 1.93 mi. Mercer and Norridgewock, to V. Minnini, Biddeford, $41,294 and $34,813 respectively—bituminous macadam paving 1.64 mi. Fryeburg, to Hagan & Thibodeau, Eden Park, R. I., $61,498—2.6 mi. Mechanic Falls, to W. H. Hinman, Skowhegan, $73,015. Grand total $500,551. Noted Feb. 26.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 1.1 mi. Contr. B-181-711, Baltimore Co., to P. Reddington & Son, 2 East Lexington St., Baltimore, $41,430. Noted Feb. 19.

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., concrete paving 1.13 mi. Contr. Wo-90-14, Worcester Co., to P. D. Phillips & Bro., Salisbury, $18,969. Noted Jan. 29.

Mass., Medfield—Town, Bd. Selectmen, L. M. Dewar, chn., sheet asphalt and bituminous macadam paving Pond and South Sts., day labor, $25,000.

Mass., Saugus—Dpt. P. Wks., A. L. Maggee, supt., Town Hall, curbing, monolithic sidewalks on Winter St., separate contracts, $25,000.

Michigan—R. A. Beers, resident engr., Kalamazoo, grading, drainage structures, shaping, concrete paving 4.942 mi. FO78-11C-3, and steel deck girder bridge, rein.-con. abutments, FA Br. 1 of 78-8-4, Contr. 2, to Grace Constr. & Supply Co., Marshall, $123,074 and $10,305 respectively; FA Br. 1 of 78-8-4, Contr. 1, to Elkhart Bridge & Iron Co., Elkhart, Ind., $1,296, for State Hy. Comn., Lansing. Grand total $134,675. Noted Feb. 19.

Michigan—A. L. Burridge, div. engr., Cadillac, grading, drainage structures 6.581 mi. FO10-6, Contr. 2, Benzie Co., to A. Jeffrey, Saginaw, for State Hy. Comn., Lansing. $115,733 incl. cement. Noted Feb. 16.

Michigan — J. T. Sharpensteen, div. engr., Escanaba, grading, drainage structures, shaping, 2 course gravel surfacing 4.955 mi. FO66-21 Contr. 1, 18 ft., Ontonagon Co., to D. L. Norton, Ontonagon, for State Hy. Comn., Lansing. $102,010 incl. cement. Noted Feb. 12.

Michigan — J. T. Sharpensteen, div. engr., Escanaba, grading, drainage structures, shaping, concrete surfacing 3.454 mi. FO55-18, Contr. 1, to Carlson & Lundin, Menominee, for State Hy. Comn., Lansing. $113,805, incl. cement. Noted Feb. 12.

Michigan — J. T. Sharpensteen, div. engr., Escanaba, grading, drainage structures 12.684 mi. FO17-33, Contr. 1, Chippewa Co., to Fitzpatrick & Gatiss, Munising, for State Hy. Comn., Lansing, $118,476 incl. cement. Noted Feb. 12.

Missouri—State Hy. Bd., Jefferson City, to Kelly & Underwood, Granby, grading, concrete paving 3.058 mi. Joplin Rd. N., Jasper Co. $62,975; 3.507 mi. Sarcoxie Rd. W., Sect. 5, $77,552; 3.665 mi. Sect. 6, same road $80,958—to C. H. Atkinson Paving Co., Watertown, S. D., 3.141 mi. Clinton Co. $33,975—to E. C. Johnson Constr. Co., Carrollton, 3.682 mi. Missouri River-Richmond Rd., Sect. 335F, $23,124; 2.945 mi. Sect. 335E same road $19,469, both Ray Co.—to Gaines Bros. Co., Eldon, 1.55 mi. Avenue City-Rochester, Sect. 315A, $63,858; 1.226 mi. Sect. 315B same road $17,040, both Andrew Co.; 1.55 mi. St. Joseph-Andrew Co. Rd., Buchanan Co. $29,633—to E. L. Markham, Cape Girdardeau, 3.068 mi. Malden-Risco Rd., Sect. 2B, $44,086; 3.055 mi. Sect. 3B, $45,276, both New Madrid Co.—to M. J. Davidson, 706 Chestnut St., St. Louis, 0.257 mi. Cape Girardeau Rd. S., $4,774; 3.019 mi. Dutchtown-Cape Girardeau Rd., Sect. 1A, $30,703; 2.242 mi. Sect. 2A, $22,839, both Cape Girardeau Co.—to H. D. Thomas, Fulton, graveling 4.334 mi. Route 66-Marius Co. Rd., Phelps Co., $28,832—4.545 mi. Bethel-Leonard Rd., Sect. 2, $14,578; 4.774 mi. Sect. 1 same road, $16,587, both Shelby Co.—to Carte-Harlin Constr. Co., West Plains, 4.13 mi. Dent Co. $31,245—to W. F. Fogleman, Jefferson City, 0.556 mi. Bloomsdale Rd. S, Ste. Genevieve Co. $4,034—to R. G. Aldridge, 1310 State St., Kansas City, Kan., grading 4.734 mi. Pickering Rd. N., Sect. 336A, $22,598; 4.677 mi. Sect. 336B same road, $40,307, both Nodaway Co.—3.549 mi. Harrisonville-Clinton Rd., Sect. 15, $16,489; 3.296 mi. same road Sect. 16, $9,580; 3.398 mi. Sect. 17, $12,652, all foregoing Cass Co.—to P. McGlone, Harrisonville, 3.124 mi. Excelsior Springs Rd. N., Clay Co. $18,315—to N. Davis, Sikeston, 3.924 mi. Marshfield-Diggins Rd., Webster Co. $18,759. Grand total $797,858. Noted Feb. 19.

Montana—State hy. Comn., Helena, to S. J. Groves & Sons Co., 529 South 7th St., Minneapolis, Minn., grading, graveling 17.75 mi. Meagher Co. $154,112; 20.807 mi. Stillwater and Yellowstone Counties, $35,504 — to L. T. Lawler, Butte, 9.978 mi. Cascade and Lewis and Clark Counties, $203,109; 14.556 mi. Deerlodge Co., $105,766—to Morrison Knudson Co., Boise, Idaho, 9.957 mi. Flathead and Lake Counties, $223,311; 17.773 mi. Mineral Co., $155,661—to Larson Erling Co., Sioux Falls, S. D., 13.866 mi. Dawson Co., $47,094—to Globe Constr. Co., Rapid City, S. D., 13.148 mi. Phillips Co., $43,205—to Hunt & Shannon, Butte, 15.092 mi. Powell Co., $50,408 — to F. C. and D. Constr. Co., Billings, 7.324 mi. Big Horn Co., $27,563—to Collison & Dolvin, Billings, 17.149 mi. Stillwater Co., $116,660—to Prahl & Smith, Miles City, 29.787 mi. Custer Co., $167,193—to Tomlinson, Arkwright Constr. Co., Great Falls, 27.526 mi. Pondera and Toole Counties, $259,453—to F. J. Haas, Grandview, 22.87 mi. Broadwater Co., $103,580—to J. C. McGuire, Butte, grading, oil processing 27.794 mi. Beaverhead Co., $155,647 — to Dakota Constr. Co., Minot, N. D., bridges in Pondera Co., $21,193—to W. P. Roscoe Co., Billings, in Stillwater Co. $8,794; in Custer Co. $25,190; in Meagher Co., $12,582 in Powder River and Carter Counties, $23,000—to W. K. Tippell, Whitefish, Deerlodge Co., $24,212—to McGuire & Blakeslee, Great Falls, in Lewis and Clark and Cascade Counties, $17,517. Grand total $1,980,754. Noted Feb. 5.

Nebraska—R. L. Cochran, engr. State Hy. Comn., Lincoln, grading, paving 3 mi. Sarpy Co., to Moran Constr. Co., 2915 North 16th St., Omaha, $55,049—4.3 mi. Lancaster Co., to Western Asphalt Paving Corp., Sioux City, Ia., $83,817—2 mi. Buffalo Co., to Diamond Eng. Co., Grand Island, $61,302. Grand total $200,168. Noted Feb. 19.

Nevada—State Hy. Dpt., Carson City, grading, graveling 10.18 mi. road from Las Vegas to point 10 mi. southeast Route 5. Sect. D-1, Clark Co., to Patrick Cline, Inc., Las Vegas, $55,267. Est $89,107. Noted Feb. 12.

N. J., Atlantic City—Atlantic Co., Court House, tar surfacing Tilton, Delilah, Bears Head, Elwood and Pleasant Mills Rds., to T. Tobish, 52 West State St., Trenton, $104,262. Noted Mar. 9 Daily.

N. J., Ocean City—Bd. City Comrs., City Hall, 24 in. curbing, guttering Central Ave., to J. Pelto, Ocean City, $16,273.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, to Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., asphalt paving Farragut Rd., $10,665—to E. Turecamo, New Cropsey Lane, Glenwood Rd. $9,285; Highlawn Ave. $3,042; Schenectady Ave. $11,563; 63rd St. $5,741; grading Foster Ave. $2,649, Avenue V. $5,627—to Rocco Contg. Co., 89 Withers St., Caton Ave., $6,879—to B. C. Vitanza, 710 Avenue W, Crospey Ave. $16,110, Shell Rd., $2,869—to Heapy Constr. Co., Belmont Ave. $375; fencing lots Lexington Ave. $849—to Castle Bros., Snyder Ave. and Johnson Pl., regulating Lake St., $3,025. Noted Feb. 19 Daily.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, to B. Turecamo, Contg. Co., New Crospey Lane, asphalt paving Beverly Rd. $18,194, East 95th St. $3,786, East 95th St. $5,011, Flatlands Ave. $31,520, Avenue H $13,550, West 4th St. $9,235, 53rd St. $5,373, 58th St. $6,314; to D. J. McCoy Asphalt Co., Avenue U and East 57th St., Elton St. $11,647. Grand total $104,630. Noted Feb. 19.

Oklahoma — State Hy. Dpt., Oklahoma City **(F.A.P. means Federal Aid Project)**, to Standard Paving Co., 2119 East 11th St., Tulsa, grading, drainage structures, concrete slab surfacing 6.699 mi. road in Custer Co. $103,019 est. $112,000; 6.933 mi. Beckham Co. $131,577 est. $145,000; 1.373 mi. F. A. P. 244-D $21,529 est. $23,000; 0.265 mi. same road Sect E $6,420 est. $7,000, both Jefferson Co.; 4.852 mi. Stephens Co. $86,887 est. $95,000 5.823 mi. F. A. P. 205-E $94,117 est. $100,000 3.054 mi. same road Sect. F $48,227 est. $55,000; 3.329 mi. same road Sect. G $35,774 est. $42,000, all Washita Co.—to Park & Co. 808 East 17th St., Oklahoma City, 6.825 mi Canadian Co. $112,564 est. $125,000; 4.468 mi F. A. P. 161-E $73,066 est. $85,000; 4.682 mi same road, Sect. F $76,502 est. $85,000, botl Kingfisher Co.—to Ellis & Lewis, 507 Surety Bldg., Muskogee, 3.851 mi. Muskogee Co. $49,222 est. $55,000; 7.326 mi. Lincoln Co. $96,898 est. $115,000; 1.488 mi. Oklahoma Co. $24,705 est. $30,000; 0.642 mi. F. A. P. 184-A $11,817 est. $15,000; 5.044 mi. same road, east of Chelsea $72,322 est. $81,000; 5.025 mi. same road, Sect. B $70,026 est. $77,000; 4.468 mi. same road, Sect. C $62,441 est. $70,000 4.225 mi. same road, Sect. D $64,318 est. $75,000; 3.801 mi. same road, Sect. E $50,203 est $58,000; 5.018 mi. same road, Sect. F $70,443 est. $78,000; 0.68 mi. same road, Sect. G $13,851 est. $18,000, all Rogers Co.—to S. O. Maxey & Co., Durant, 2.589 mi. Bryan Co. $45,679 est. $52,000; 5.142 mi. Hughes Co. $79,397 est $90,000—to W. R. Gibson, Pauls Valley, 5.862 mi. F. A. P. 202-A, $105,291 est. $115,000; 1.227 mi. F. A. P. 162-A $23,446 est. $25,000; 7.923 mi. same road, Sect. B $97,763 est. $130,000, all Grady Co.—to Union Constr. Co., 200 New York St., Des Moines, Ia., 4.901 mi. F. A. P. 162-H $81,462 est. $90,000; 4.901 mi. same road, Sect. I $78,216 est. $85,000, both Canadian Co. Grand total $1,887,182. Noted Feb. 26.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, concrete paving Cannon Pl., to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $23,303; macadam paving Stevenson Pl., to J. J. O'Rourke, 238 Gordon St., $2,195. Noted Mar. 6 Daily.

Oklahoma—State Hy. Dpt., Oklahoma City, to Standard Paving Co., 2119 East 11th St., Tulsa, grading, drainage structures, concrete surfacing 0.636 mi. road east of Elk City, Beckham Co. $11,220 est. $15,000, 2.188 mi. road east of Elk City, $34,719 est. $40,000, both Beckham Co., 6.457 mi. Custer Co. $101,229 est. $110,000—to Briscoe Const. Co., Stillwater, 3.345 mi. Pawnee Rd. $46,232 est. $55,000; 5.021 mi. Morrison Rd. $72,736 est. $80,000, both Noble Co.; 8.064 mi. Payne Co. $108,213 est. $120,000. Grand total $373,349.

Oklahoma—State Hy. Dpt., Oklahoma City, gravel top surfacing 23.2 mi. road in Osage Co., 20 ft., to L. L. Massey, 3206 West 12th St., Oklahoma City, $21,852 est. $25,000; 17.7 mi. Pushmataha Co., 18 ft., to Ellis & Lewis, 507 Surety Bldg., Muskogee, $7,843 est. $25,000.

Okla., Tulsa—City Comn., widening 8 blocks 3rd St. from Utica to Lewis Aves., 22½ ft., to H. L. Cannady & Co., 1122 South Lewis St., $38,914. Est. $45,000.

Ore., Portland — City, improving Yeon Ave., 29th and Nicolai Sts., to Parker Schram Co., Couch Bldg., $24,863. Est. $36,390.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, concrete surfacing 7.905 mi. roads in Dickson Co. and 5.634 mi. Humphreys Co., to Zeigler Constr. Co., Amer. Trust Bldg., Nashville, $119,896 and $87,790 respectively—11.454 mi. Lake and Obion Counties, to Lawrence Bros., Jackson, Miss., $191,517—9.565 mi. Hickman Co., to Municipal Paving Co., Cotton States Bldg., Nashville, $223,236 — grading, drainage structures 8.637 mi. Rhea Co. and 5.529 mi. Washington Co., to Brown Contg. Co., 706 Manning St., Chattanooga, $53,979 and $88,140 respectively—4.08 mi. Montgomery Co., to E. A. Wood, Cotton States Bldg., Nashville, $29,793—7.016 mi. Montgomery Co., to Young & Lyons, Rogersville, $75,084—5.598 mi. Van Buren Co., to Bell & Bell, 101 Broad St., Nashville, $42,820. Grand total $912,255. Noted Feb. 12.

Texas—G. Gilchrist, state hy. engr., Austin, double bitulithic surfacing 12 mi. Cherokee Co., to McKinney & Parmalee, Nacogdoches, $20,435 est. $25,000 — concrete paving 7.416 mi. Brazoria Co. and 16.048 mi. Grayson Co., to Dexter Constr. Co., Hangar No. 10, Love Field, Dallas, $176,889 and $320,348 respectively est. $180,000 and $380,000 respectively—17.396 mi. Freestone Co., to F. P. McElwrath, Box 727, Corsicana, $378,375 est. $440,000—triple bit. surface on waterbound macadam base course surfacing 15.498 mi. Foard Co., to J. L. and E. A. Vilbig, 2517 Eakin St., Dallas, $142,795 est. $200,000, all foregoing 18 ft. wide. Grand total $1,038,842. Noted Feb. 12, 19 and 26.

Tex., Beaumont—Paving College St. between Ave. D. and 4th St., to Broussard-Warfield Co., Beaumont, $35,415.

Vermont—State Hy. Dpt., Montpelier, rein.-con. paving 5.2 mi. hy. Barre and Williamstown, to Lane Constr. Corp., 134 State St., Meriden, Conn., $189,455. Noted Feb. 19.

Virginia—State Hy. Dpt., Richmond, clearing, grubbing, grading, drainage structures, one course macadam surfacing 1.378 mi. roads in Augusta Co., to Pocahontas Constr. Co., Inc., Cass, W. Va., $27,506—0.248 mi. Wythe Co., to R. H. Bolling, Norton, $23,050—clearing, grubbing, grading, drainage structures, soil surface treating 7.068 mi. Brunswick Co., to J. J. Battershill & Son, Virgilina, $44,080—clearing, grubbing, grading, drainage structures, concrete surfacing 1.56 mi. Nansemond Co., to Tunstall-Johnson Co., Inc., Norfolk, $42,417—5.8 mi. Nansemond Co., to Guilford Constr. Co., Greensboro, N. C., $110,858—clearing, grubbing, grading, drainage structures, gravel surfacing 2.756 mi. Chesterfield Co., to Sanderson, Son & Parker, Cartersville, $21,815—clearing, grubbing, grading, drainage structures 7.405 mi. Madison Co., to Perkins-Barnes Constr. Co., Inc., Blackstone, $28,345—30 ft. rein.-con. beam span bridge over Proctors Creek, Chesterfield Co., to Fredericksburg Bridge Co., Fredericksburg, $2,771—two 36 ft. 3 in. span concrete beam bridge over Swift Creek, Chesterfield Co., to J. S. Bowers, Whiteville, N. C., $6,852. Grand total $307,694. Noted Feb. 19.

Wash., Seattle—Bd. P. Wks., paving 28th Ave. and 28th Ave. N., et al., to S. A. Moceri, Inc., Thompson Bldg., $42,478. Noted Mar. 5.

Wis., Waukesha—Concrete paving, to Parkinson Constr. Co., 3518 West Highland Ave., Milwaukee, $43,927.

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WATERWORKS AND SEWERS PLANNED FOR THIS YEAR

From Recent Engineering News-Record Public Works Survey

	Waterworks	Sewers
ALABAMA		
Birmingham	.....	$205,234
Mobile	$200,000	250,000
CALIFORNIA		
Bakersfield	.....	3,800
Long Beach	701,000	1,606,000
Oakland	1,010,000	.....
Palo Alto	2,460	7,500
Pasadena	10,250,000	.....
San Diego	175,000	204,500
San Jose	50,000	14,500
Santa Ana	64,000	6,000
Santa Cruz	70,000	2,000
Los Angeles Co.	29,885	593,579
Los Angeles (San Dist.)	.....	510,545
Orange County	47,345	48,398
COLORADO		
Colorado Springs	77,000	2,000
Del Norte	2,000	.....
Denver	1,100,000	285,000
Genoa	20,000	3,000
Grand Junction	56,500	.....
La Junta	2,000	.....
Mancos	2,500	.....
Pueblo	45,000	10,000
Trinidad	10,900	.....
CONNECTICUT		
Meriden	60,000	15,000
ILLINOIS		
Bloomington	26,000	7,000
Canton	20,000	5,000
Chicago	.....	6,578,000
East St. Louis	.....	51,000
Kewanee	5,000	.....
Ottawa	27,000	90,000
Peoria	.....	1,180,000
INDIANA		
Evansville	100,000	.....
Kokoma	.....	15,000
Indianapolis	.....	75,000
IOWA		
Cedar Rapids	.....	250,000
Davenport	.....	40,000
Des Moines	.....	150,000
Mason City	.....	30,000
Ottumwa	100,000	10,000
Sioux City	70,550	60,000
Massena	6,000	.....
KANSAS		
Hays	4,000	.....
Wichita	.....	200,000
KENTUCKY		
Louisville	500,000	4,500,000
LOUISIANA		
Abbeville	25,000	175,000
Baton Rouge	290,000	200,000
Bogalusa	13,000	.....
Clinton	27,000	.....
Donaldsonville	.....	148,000
Gretna	.....	150,000
Lake Charles	250,000	10,000
Many	14,000	.....
Natchitoches	40,000	.....
New Orleans	100,000	.....
Slidell	.....	40,000
MAINE		
Augusta	.....	15,000
Portland	.....	170,000
MASSACHUSETTS		
Reading	125,000	20,000
Worcester	200,000	700,000
Boston	.....	1,000,000
MICHIGAN		
Ann Arbor	325,000	270,000
Dearborn	50,000	700,000
Detroit	14,000,000	8,750,000
Flint	.....	350,000
Oakland	.....	250,000
Wayne County	.....	2,240,000
MINNESOTA		
Albert Lea	10,000	25,000
Austin	.....	10,000
Duluth	.....	180,000
Minneapolis	300,000	600,000
MISSISSIPPI		
Greenville	.....	35,000
Laurel	70,934	80,947
MISSOURI		
Jefferson City	.....	50,000
Mountain Grove	20,000	.....
St. Louis	1,500,000	2,500,000
NEBRASKA		
Alliance	6,500	20,103
Omaha	150,000	.....
South Sioux City	10,060	.....
Rushville	20,000	.....
NEW JERSEY		
Burlington	.....	150,000
Florence Township	.....	240,000
Princeton	.....	750,000
NEW YORK		
State Dept. Pub. Works	.....	4,000,000 (inc. water lines)
New York City (Five boroughs)	20,000,000	24,200,000 (including paving)
Albany	1,699,612	125,000
Auburn	15,000	.....
Binghamton	10,000	70,000
Elmira	.....	100,000
Syracuse	1,445,000	300,000
Watertown	30,000	.....
OHIO		
Akron	600,000	750,000
Beachwood	.....	50,000
Bexley	12,000	110,000
Cincinnati	550,000	.....
Cleveland	3,700,000	19,000,000
Cleveland Hghts	20,000	400,000 (inc. pav'g)
Cuyahoga Hghts	.....	100,000
Dayton	100,000	150,000
East Cleveland	.....	60,000
Elyria	14,000	70,000
Garfield Hghts	80,000	50,000
Lakewood	5,000	40,000
Northfield	75,000	(inc. sewers)
Parma	.....	100,000
Rocky River	.....	90,000
Shaker Hghts	.....	50,000
South Euclid	.....	25,000
Up. Arlington	15,000	5,000
Van Wert	.....	400,000
Wickliffe	.....	200,000 (inc. pav'g)
Willowick	.....	200,000
Cuyahoga Co.	60,000	500,000
Franklin Co.	200,000	600,000
Hamilton Co.	400,000	500,000
Lake Co.	.....	90,000
Montgomery Co.	.....	200,000
Summit Co.	155,000	40,000
OKLAHOMA		
Clinton	.....	25,000
Guthrie	.....	45,000
Holdenville	.....	35,000
Hominy	9,000	.....
Lawton	690,000	100,000
Muskogee	200,000	.....
Oklahoma City	750,000	2,375,000
Shawnee	.....	25,000
Tulsa	300,000	500,000
OREGON		
Portland	758,000	633,334
PENNSYLVANIA		
Altoona	25,000	20,000
Franklin	45,000	.....
Philadelphia	.....	4,000,000
Ridgway	80,000	.....
So. Brownsville	.....	20,000
Morrisville	3,500	.....
RHODE ISLAND		
Pawtucket	400,000	500,000
SOUTH DAKOTA		
Aberdeen	.....	15,000
Huron	20,000	.....
Pierce	5,000	.....
Rapid City	20,000	60,000
Sioux Falls	15,000	40,000
TENNESSEE		
Knoxville	10,598	423,242
TEXAS		
Amarillo	200,000	150,000
Alpine	6,000	.....
Austin	.....	185,000
Brady	2,500	.....
La Feria	8,000	2,000
Lockhart	.....	12,000
Port Arthur	25,000	10,000
San Antonio	400,000	1,500,000
UTAH		
Ogden	.....	45,000
Provo	10,000	135,000
Salt Lake City	115,000	410,000
VERMONT		
Burlington	.....	15,000
Montpelier	21,000	10,000
VIRGINIA		
Richmond	300,000	200,000
WASHINGTON		
Seattle	2,600,000	875,000
WISCONSIN		
Milwaukee	1,750,000	1,280,000
Milwaukee (Co.)	.....	616,000
Superior	.....	12,000
Waukesha	95,000	2,000
Whitefish Bay	80,000	15,000
Total	$70,609,784	$107,429,240

EXCAVATION

PROPOSED WORK

Ind., Brazil—Bd. Comrs. Clay Co., constructing Connelly Ditch. $25,000. E. Schauwecker, Brazil, engr.

Ind., Greenfield — Bd. Comrs. Hancock Co. dredging Dunwoody and Ham Ditches. $26,000. D. Thomas, Greenfield, engr.

Ind., Princeton—Bd. Comrs. Gibson Co. constructing Johnson-Williams Ditch. $27,000. H. C. Morrison, Princeton, engr.

Ind., Wabash—Bd. Comrs. Wabash Co. repairing Reahad Ditch, part tile and part open ditch. $25,000. J. L. Bear, Wabash, engr.

Mass., Belmont—A. Marvin, 73 Elm St., soon takes bids real estate development, incl. excav., grading, Belmont Hill. $25,000 or more. Private plans.

Mass., Vineyard Haven—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, dredging, harbor improvements. $25,000 or more.

Mass., Winchester — Town, H. W. Stevens, straightening, widening Russell Brook. $25,000.

BIDS ASKED

Mass., Brookline—Mar. 20, by Bd. Water Comrs., excavation, water pipe trenches in various streets.

CONTRACTS AWARDED

Calif., Oakland — City Port Comn., placing 600,000 cu.yd. dredged material at Key Route Mole, to Longview Dredging Co., Rio Vista, at $0.03 per cu.yd.

Calif., Orange—See "Waterworks."

Louisiana — Bd. Comrs. Arnaudville Gravity D. D. 17, St. Landry and St. Martin Parishes, removing 2,000,000 cu.yd. earth to P. Erickson, Sebewaing, Mich., at $0.0673 per cu.yd. and at $30 per acre for clearing. Noted Feb. 12.

La., Arnaudville—Arnaudville Gravity D. D. 17, St. Landry and St. Martin Parishes, gravity drainage system, incl. 2,000,000 cu.yd. earth excav., to P. Erickson, Sebewaing, Mich., at $0.0673 per cu.yd.

Mass., Boston—American International Engr. & Equipment Assoc. Syndicate, c/o J. H. Hodsdon, engr., 53 State St., dredging for ship and railroad terminal at Cow Pasture, Mt. Vernon St., Dorchester, to Standard Dredging Co., Woolworth Bldg., New York. Est. exceeds $25,000.

N. J., Beach Haven — Beach Haven Yacht Club, F. O. Remyan, chn., Fire House, timber bulkhead and pier, to James Ferry Co., Virginia and Mediterranian Aves., Atlantic City; dredging, to Hill Dredging Co., 5601 Atlantic Ave., Atlantic City. Noted Feb. 19.

Bond Elections

Coming Bond Elections

Waterworks—Ariz., Prescott. $150,000.
Sewage Disposal Plant—Minn., Willmar. Apr. 7. $25,000.
Sewers—Mo., Springfield. Mar. 20. $700,000.
City Hall—Minn., Rochester. Apr. 21. $189,000.

Bonds Voted

Sewers—Conn., New Canaan. $115,000.
Sewage Disposal—Mo., Sullivan. $25,000.
Parks, Playgrounds, Street Impvt., etc.—Calif., Los Angeles. $5,000,000.

Bonds Defeated

Sewage Disposal Plant—Mo., Mexico. $75,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ala., Mobile—WHARF—U. S. Health Dpt. 500 ft. wharf at quarantine station, mouth Mobile River.

Calif., Sacramento — POST OFFICE, etc. — Treas. Dpt. at office Sup. Archt., plans by Starks & Flanders, Forum Bldg., post office and court house. $1,300,000. Noted Aug. 21, 1929.

Calif., San Francisco — HOSPITAL — Con. Q. M., 3 story, rein.-con. addition to Ward 11, 2 story, rein.-con. addition to Ward 10, at Letterman General Hospital, Presidio of San Francisco.

Calif., Stockton—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by Bliss & Fairweather, Balboa Bldg., San Francisco, post office. $695,000.

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Federal Government (Continued)

D. C., Wash.—OFFICE—Dpt. Justice plans by Zantzinger, Borie & Medary, Architects Bldg., Phila., Pa., office for Dpt. Justice, Triangle. $4,000,000. Noted Oct. 4, 1928.

Ind., Vincennes—MEMORIAL—U. S. Government, George Rogers Clark Memorial $1,500,000. **Maturity after May 1.** Hirons & Mellor, 40 East 49th St., New York, archts. Noted Mar. 6.

N. J., Newark—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by J. H. and W. C. Ely, 605 Broad St., brick, steel, rein.-con. post office and federal building, Franklin and Walnut Sts. $6,150,000.

N. Y., New York—POST OFFICE—Treas. Dpt. at office Sup. Archt., branch post office, Lexington Ave. and 44th St. To exceed $5,000,000. **Maturity in late fall.**

Tenn., Memphis—DREDGES—U. S. Eng., two 32 in. channel dredges of dust pan suction head type.

Tenn., Memphis—DRAG LINE MACHINE—U. S. Eng. 1 bank grader dragline machine.

Tex., Randolph Field—GARAGES—Con. Q. M. 300 rein.-con., hollow tile, stucco garages for officers.

Tex., Texas City—RUBBLE MOUND—U. S. Eng., Galveston, rubble mound on Texas City Dike.

BIDS ASKED

Alabama—DREDGING—Mar. 31, by U. S. Eng., Montgomery, 783,000 cu.yd. channel from Pensacola Bay through Big Lagoon from Old River to mouth of Portage Creek; adv. E.N.-R. Mar. 19.

Ala., Tuscaloosa—HOSPITAL—Apr. 21, by Vet. Bu., Arlington Bldg., U. S. Veterans Hospital, incl. roads, walks, grading, drainage; adv. E. N.-R. Mar. 19. Noted Sept. 4.

Arizona—ROAD—Mar. 31, by C. H. Sweetser, dist. engr., Pub. Rds., Grand Canyon, Ariz., plant mixed oil-treated crushed rock surfacing 27.97 mi. Sects. A and B, Route 2, Grand Canyon-Old Trails Natl. Forest Hy., Coconino Co.

California—ROAD—Mar. 24, by C. H. Sweetser, dist. engr., Pub. Rds., 461 Market St., San Francisco, oil processing on crushed rock surfacing 34.662 mi Sects. E and A, B, C1, C2, C3, C4, D and E Route 1, Loon Route, Lassen-Volcanic Natl. Park, Tehama and Shasta Counties.

D. C., Wash.—TUNNEL—Apr. 8, at office Executive Officer Arlington Memorial Bridge Com., Navy Bldg., tunnel under Memorial Parkway to cemetery on Virginia Shore of Arlington Memorial Bridge Project; adv. E.N.-R. Mar. 19.

Ill., Woodstock—POST OFFICE—Apr. 8, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. Mar. 19.

Ind., Fort Benjamin Harrison—ROADS—Mar. 20, by Con. Q.M. concrete roadway at Army Post. $25,000.

Ia., Mason City—POST OFFICE—Apr. 6, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. Noted Oct. 16.

La., New Orleans—EARTHWORK—Mar. 27, by U. S. Eng., Prytania St., 3,720,000 cu.yd. earthwork in 2nd New Orleans Dist.

Mass., Boston—POST OFFICE—Mar. 24, by Treas. Dpt. at office Superv. Archt., supplemental bids, 21 story, basement, sub-basement, brick, steel, granite post office. $6,000,000. Noted Feb. 19.

Mass., Chelsea—HOSPITAL—Spec. 6430—Mar. 25, by Yards & Docks, Navy Dpt., Naval Hospital addition 3 story, basement. $175,000. Noted Feb. 26.

Michigan—DREDGING—Apr. 10, by U. S. Eng., Detroit, in Saginaw River; adv. E. N.-R. Mar. 19.

Minn., Hastings—DREDGING—Mar. 24, by U. S. Eng., Commerce Bldg., St. Paul, 155,000 cu.yd. in Mississippi River, at government dam. Noted Feb. 26.

Minn., St. Paul—DREDGING—Mar. 24, by U. S. Eng., 615 Commerce Bldg., St. Paul, widening channel in Mississippi River for turning basin at St. Paul River Terminal.

Miss., Greenville—REMODELING—Apr. 2, by Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office.

Miss., Vicksburg—DREDGE—Apr. 28, by U. S. Eng., P. O. 667, constructing, delivering afloat one 16 in. self-propelled pipe line dredge; adv. E. N.-R. Mar. 19.

Mo., South St. Joseph—DIKES—Apr. 4, by U. S. Eng., 707 Postal Telegraph Bldg., Kansas City, 1,500 lin.ft. standard pile clump dikes in Missouri River at Contrary Bend, about 2.8 mi. downstream.

New Jersey—DREDGING—Mar. 20, by U. S. Eng., 39 Whitehall St., New York, 1,303,000 cu.yd. in Passaic River; adv. E.N.-R. Mar. 19.

New Jersey—RIPRAP STONE—Mar. 20, by U. S. Eng., Phila., Pa., 2,900 lin.ft. concrete riprap stone superstructure on dike in Delaware River, near Hope Creek.

N. J., Fort Monmouth—ROADS—Apr. 16, at office Con. Q.M., roads, storm drains, walks, water lines, etc.; adv. E. N.-R. Mar. 19.

N. Y., Newburgh—POST OFFICE—Apr. 2, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

N. Y., Staten Island—POST OFFICE—Apr. 13, by Treas. Dpt. at office Sup. Archt., constructing (except elevator) U. S. Post Office; adv. E. N.-R. Mar. 19.

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R. I., Newport—ASSEMBLY SHOP—Spec. 6437—Apr. 1, by Yards & Docks, Navy Dpt., extending assembly shop, at Naval Torpedo Station, Goat Island; adv. E.N.-R. Mar. 19. Noted Mar. 12.

S. D., Sioux Falls—POST OFFICE—Apr. 14, by Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office and Court House; adv. E. N.-R. Mar. 19. Noted Mar. 13 Daily.

Tex., Presidio—FUMIGATION PLANT—See "Contracts Awarded."

Tex., Randolph Field—INCINERATOR—Apr. 6, at office Con. Q.M., constructing incinerator at Randolph Field; adv. E.N.-R. Mar. 19. Noted Jan. 23, 1930.

Tex., Randolph Field—APARTMENT—Apr. 6, by Con. Q.M., one officer's apartment building; adv. E.N.-R. Mar. 19.

Tex., Randolph Field—SCHOOL—Apr. 9, by Con. Q.M., constructing School of Aviation Medicine; adv. E.N.-R. Mar. 19.

Wash., Seattle—HOSPITAL—Treas. Dpt. at office Sup. Archt., bids about Apr. 20, U. S. Marine Hospital, Beacon Hill. $2,000,000. Bebb & Gould and J. Graham, Hoge Bldg., archts. Noted Mar. 12.

CONTRACTS AWARDED

Arizona—ROAD—Pub. Rds., San Francisco, Calif., grading oil processing 9.98 mi. Bright Angel Springs-North Entrance Rd., Grand Canyon Natl. Park, Coconino Co., to O. A. Lindberg, Stockton, Calif., $81,380, est. $95,994; grading, draining 8.432 mi. House Rock Canyon Rd., Kiabab Natl. Forest, Coconino Co., to Jasper-Stacy Co., 216 Pine St., San Francisco, Calif., $136,371, est. $135,779. Noted Feb. 12 and 26.

Calif., Los Angeles—RUNWAY—Yards & Docks, Navy Dpt., improving seaplane runway at Naval Operating Base, Air Station, to W. M. Ledbetter & Co., 5351 Valley Blvd., San Diego, $13,797.

Calif., Mare Island—ELEVATOR SHAFT, etc.—Yards & Docks, Navy Dpt., elevator shaft, lobby at Naval Hospital, to Sullivan & Sullivan, Oakland, $10,078.

Calif., San Diego—BARRACKS—Spec. 6419—Pub. Wks. Officer, Navy Yard, barracks at Training Station, to F. L. Stimson Contr. Co., La Jolla, $342,450. Noted Feb. 19.

Colorado—ROAD—Pub. Rds., Denver, grading 1.585 mi. South St. Vrain Natl. Forest Rd., Colorado Natl. Forest, Boulder Co., to W. O. Morrison, Cooper Bldg., Denver, $30,681. Noted Feb. 11.

D. C., Wash.—WATER SOFTENING PLANT—Yards & Docks, Navy Dpt., water softening plant at U. S. Navy Yard, to Permutit Co., 440 4th Ave., New York, $14,900.

Florida—TRAINING WALLS, etc.—U. S. Eng., Jacksonville, repairing 8 mi. training walls and revetments St. Johns River between entrance and Dames Point, to Parkhill Dredging Co., Florida Theatre Bldg., Jacksonville, $284,240. Noted Jan. 22.

Ill., Great Lakes—HANGAR—Yards & Docks, Navy Dpt., extending seaplane hangar at Naval Training Station, to Anderson & Co., 1956 Laurence St., Chicago, $16,010.

Kan., Dodge City—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to J. I. Barnes, Logansport, Ia., $112,500. Noted Feb. 12.

Mass., Springfield—POST OFFICE—Treas. Dpt. at office Sup. Archt., 5 story, basement, 130 x 180 ft. brick, stone, to N. P. Severin Co., 222 West Adams St., Chicago, Ill. Est. $1,750,000. Noted Mar. 5.

Nev., Las Vegas—DAM—Bureau Reclamation, Wilda Bldg., Denver, Colo., constructing Hoover Dam, Boulder Canyon Project, Arizona-Nevada-California, on Colorado River, to Six Companies, Inc., composed of Utah Constr. Co., Morrison & Knudsen, McDonald & Kahn, J. F. Shea Co., Kaiser Paving Co., and Bechtel Constr. Co., headquarters at 526 Phelan Bldg., San Francisco, Calif., $48,890,995. Noted Dec. 25.

N. Y., Oneida—POST OFFICE—Treas. Dpt. at office Sup. Archt. U. S. Post Office, to A. M. Lundberg, Railway Exch. Bldg., St. Louis, Mo., $95,700. Noted Mar. 9 Daily.

O., Conneant—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to R. A. Williams Co., 100 West Monroe St., Chicago, Ill., $71,900. Noted Mar. 5.

O., Massillon—REMODELING, etc.—Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office, to E. E. Garber, Bethlehem, Pa., $18,900. Noted Feb. 19.

Okla., Bartlesville — ELEVATOR — Treas., Dpt. at office Sup. Archt., elevator in U. S. Post Office, to Otis Elevator Co., 810 18th St., Wash., D. C., $10,247. Noted Jan. 29.

Oregon—ROADS—U. S. Foresty Serv., Post Office Bldg., Portland, grading 4.695 mi. forest roads, Lane Co., to Oregon Bridge & Dredging Co., Portland, $95,556.

Pa., Phila.—BAFFLE WALL and SHOP—Yards & Docks, Navy Dpt., baffle wall, extending Test Building 480, at Naval Aircraft Factory, Navy Yard, to G. T. Holloway, Phila., Pa., $14,210.

Pa., Phila.—RAILROAD—Yards & Docks, Navy Dpt., improving railroad at Naval Ammunition Base, Fort Mifflin, to W. G. Shaner & Sons, Wyoming and B Sts., $24,955.

Pa., Phila.—SHOP—Yards & Docks, Navy Dpt., extending shop building, U. S. Marine Corps, to Wark Co., Eddystone, Phila., Pa., $168,980. Noted Feb. 19.

Pa., Pittsburgh — FOUNDATIONS — Treas. Dpt. at office Sup. Archt., foundations for U. S. Post Office to Booth & Flinn Co., 1942 Forbes St., $554,961.

R. I., Newport—HOSPITAL—Yards & Docks, Navy Dpt., main building extension at Naval Hospital, to Lamoureux Bros., Woonsocket, $117,570. Noted Feb. 18.

R. I., Newport—POWER PLANT—Yards & Docks, Navy Dpt., will build power plant improvements, distribution station. $30,000. Noted Mar. 5.

Tex., Fort Sam Houston (mail San Antonio)—QUARTERS—Con. Q. M., constructing, completing 21 officers' quarters, to R. E. McKee, 1918 Texas St., El Paso, $249,438. Noted Jan. 22.

Tex., Presidio—FUMIGATION PLANT—Dpt. Interior, 10x275 ft. fumigation plant, day labor, $45,000.

Va., Hampton Roads—PIER—Spec. 6404—Yards & Docks, Navy Dpt., replacing Pier 7 at Naval Operating Base, to Merritt, Chapman & Williams, Inc., New Orleans, La., $569,700. Noted Feb. 19.

RAILWAYS

PROPOSED WORK

Kentucky—City and Louisville & Nashville R.R. Co., 10th St. and Bway., Louisville, W. H. Courtenay, ch. engr., elevating double tracks railroad over Bway. and Baxter Ave., possible 1 other street, in Louisville. A. A. Kreiger, city engr. A. T. Fischer, assistant city engr. in charge grade elimination.

Louisiana—Pub. Serv. Co., Inc., 317 Baronne St., New Orleans, constructing, renewing street railway tracks, overhead wires, paving, repaving Franklin Ave. from Dorgenois to Bay St., $100,000; rebuilding several street intersections, various types paving, $30,000, both in New Orleans.

Missouri—Wabash R.R. Co., W. R. Bennett, ch. engr., Exch. Bldg., St. Louis, new double track line from point in St. Louis Co. several miles east of Missouri River to St. Charles.

Texas—Southern Pacific Ry. Co. Lines, (in Texas and Louisiana), R. W. Barnes, Houston, ch. engr., ballasting roadbed from Hondo to El Paso, probably use crushed rock. $250,000. Private plans.

Utah—Western Pacific R.R. Co., J. W. Williams, ch. engr., Mills Bldg., San Francisco, Calif. preliminary plans ballasting 43 mi. road between Clive and Burmester. $24,000.

Montreal, Que.—Montreal Tramways Co. Ltd., Craig St., Montreal, W. Mc G. Gardner, genl. supt. constr. and maintenance, 159 Craig St. W., Montreal, extensions to car lines on Sherbrook St., Girouard and Grand Aves., Montreal.

BIDS ASKED

California—Mar. 25, by Los Angeles City Harbor Dpt., B. Edwards, mgr., Los Angeles, furnishing girder rails, frogs, switches, miscellaneous rail materials for trackage for West Basin Terminal, at Berths 144 and 146, in Los Angeles. $115,000. Work will be done by force account.

Louisiana—See "Contracts Awarded."

CONTRACTS AWARDED

California—See "Bids Asked."

Louisiana—New Orleans Pub. Serv. Co., Inc., 317 Baronne St., New Orleans, reconstructing tracks, wires, improving Ferret St. from Jackson to Napoleon Aves. in New Orleans, own forces. $41,538. Private plans.

Pennsylvania—Pennsylvania R.R. Co., W. D. Wiggins, ch. engr. (Central Region) Union Station, Pittsburgh, new yard, doubling present capacity, 12 tracks at widest point, in Bellefonte, to Andrews Constr. Co., Tyrone, $100,000.

SUBWAYS AND TUNNELS

PROPOSED WORK

Que., Montreal—City and Montreal Tramways, 159 Craig St. W., soon take bids subway under Lachine Canal, at Cote St. Paul, probably on Briand St. $3,000,000 probably cost plus 10% of work. Montreal Tramways, 159 Craig St. W., engrs. Fraser-Brace Eng. Co. Ltd., 159 Craig St. W., probable contractor.

BIDS ASKED

Wash., Seattle—See "Residential."

CONTRACTS AWARDED

Mass., Boston—City of Boston, Transit Dpt., 1 Beacon St., constructing Sect. A, steel, concrete traffic tunnel between Boston and East Boston, to Silas Mason Co., Inc., 52 Vanderbilt Ave., New York, $5,696,510. Noted Feb. 5.

GRADE CROSSINGS

PROPOSED WORK

Mass., Mansfield—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, Town, and New York, New Haven & Hartford R.R., E. E. Oviatt, ch. engr., New Haven, Conn., grade crossing—overpass or underpass, Town Way—Central St. $2,000,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mo., Hannibal—State Hy. Dpt., Jefferson City, rein.-con. viaduct, approaches to carry State Hy. 61, over Wabash Ry. and Chicago, Burling-

Grade Crossings (Continued)

ton & Quincy R.R., near here. $53,802. Rail roads to share cost.

N. J., Lakewood—Bd. Freeholders Ocean Co., Court House, Toms River, concrete, steel double underpass to take care through traffic on north and south travel on Lakewood-Adelphia Rd. and travel from West Jersey over proposed new road from Lakehurst. $25,000 or more. H. C. Shinn, Municipal Bldg., co. engr. Noted Mar. 5. Project in abeyance.

N. J., Ridgefield—Bd. Freeholders Bergen Co., Court House,, Hackensack, preliminary plans eliminating grade crossing at Edgewater Ave. and Northern Div. Erie R.R. tracks by constructing concrete, steel overpass. $25,000 or more. R. McClave, Court House, Hackensack, co. engr. Noted Oct. 17.

Pa., Yatesville—Erie R.R. Co., 50 Church St., and 71 West 23rd St., New York, G. S. Fanning, ch. engr., grade crossing. $36,000.

Pa., Crafton—Boro, J. O. Schreiber, secy., Boro Bldg., and Pennsylvania R.R. Co., W. D. Wiggins, ch. engr. (Central Div.) Union Station, Pittsburgh, soon take bids grade crossing elimination at White St. and railroad. $490,000. McCully Eng. Co., Berger Bldg., Pittsburgh, engrs.

CONTRACTS AWARDED

Pa., Glenn—Pennsylvania R.R. Co., W. D. Wiggins, ch. engr. (central region) Union Sta., Pittsburgh, concrete hy. bridge over tracks 1.5 mi. west of Carnegie, Allegheny Co., to Ferguson & Edmundson Co., Keystone Bldg., Pittsburgh. Est. $25,000.

PIERS AND WHARVES

PROPOSED WORK

Calif., Los Angeles—PIER—Los Angeles Co. recreation pier, wood deck, steel piling H-type, 60 ft. wide, extending 700 ft. into ocean, Redondo Sect. $170,000. K. T. Corson, County Recreation Camps and Playground Comn., engr.

N. J., Linden—DOCK—Bd. City Council, City Hall, concrete, timber dock, at Rahway River, $25,000 or more. **Maturity probably soon.**

R. I., Providence—PIER, etc.—State, Harbor Comn., H. E. Winsor, chn., reconstructing pier, warehouse at waterfront, recently destroyed by fire.

BIDS ASKED

N. Y., New York—PIER—Dpt. Docks, A. Cosgrove, comr. Pier "A", Battery Pl., bids about April 1, repairing pier, 30th St., North River, $50,000; Pier 36, East River, $13,000; Pier, foot East 32nd St., $8,000.

AIRPORTS

PROPOSED WORK

Tenn., Trenton—Chamber of Commerce, C. E. Myers, secy., airport development, incl. hangar, markers, on 70 acre tract.

GRAIN ELEVATORS

PROPOSED WORK

Kan., Wellington—GRAIN ELEVATOR—Wolcott & Lincoln, c/o Horner & Wyatt, engrs., 468 Bd. of Trade Bldg., Kansas City, Mo., 500,000 bu. grain elevator 183 ft. high, 40 x 226 ft. $150,000.

B. C., Vancouver — GRAIN ELEVATOR — Searle Grain Co., Winnipeg, Man., 1,000,000 bu. grain elevator.

CONTRACTS AWARDED

Mo., Kansas City—GRAIN ELEVATOR—Missouri Pacific Ry. Co., E. A. Hadley, ch. engr., Missouri Pacific Bldg., St. Louis, and Continental Export Co., Merchants Exch. Bldg., St. Louis, superstructure 2,500,000 bu. grain elevator, rein.-con., to S. Patti Constr. Co., 705 Finance Bldg. Est. $1,000,000. Bins, hoppers, tubes, piping car loading spouts, distributing spouts, elevator legging and heads, to Standard Steel Wks., 16th and Howell Sts., North Kansas City. Noted Feb. 19.

Que., Montreal—GRAIN ELEVATOR—Canada Malting Co. Ltd., 5022 St. Ambroise St., general contract 600,000 bu. grain elevator, rein.-con., with central marine tower, to E. G. M. Cape & Co., 620 Cathcart St. $200,000. Noted Feb. 19.

POWER AND LIGHTING

PROPOSED WORK

New York—New York Power & Light Co., subsidiary Niagara Hudson Power Corp., 15 Broad St., New York, and New York Edison Co., Irving Pl., New York, two 110,000 volt high voltage power lines from Yonkers to Poughkeepsie. $10,000,000.

Okla., Buffalo — State Fuel Supply Co., Anadarko, granted franchise natural gas system. $40,000. G. R. Carpenter, Anadarko, engr.

CONTRACTS AWARDED

Ariz., Tucson—See "Power Plants."

Ill., Chicago—M. J. Kennedy, comr. Gas & Electricity, City Hall, 6,905 street lights, except posts, in residential section, to Electric Contg. Co., 844 Rush St., $1,063,000. City forces at work on installing new lights in area bounded by 33rd and 47th Sts., Cottage Grove Ave. and the Lake, $100,000 and replacing 3,000 lights in business sections, $450,000. Noted Feb. 11.

O., Cleveland—City, electric work and flood lights for new Lakefront Stadium (now under construction), to Parker Electric Co., 4502 Prospect Ave., $157,667.

PARKS AND SPORTS

PROPOSED WORK

Calif., Los Angeles—City plans by R. E. Hoyt, supt. Construction, City Playground & Recreation Dpt., 2 concrete swimming pools, each 18 meters wide, 50 meters long, grandstand for Olympic Games 1932, filtration system, $110,000.

Conn., Hartford—See "Hospitals."

Conn., Windsor — Loomis Institute, N. H. Bachelder, head master, plans by R. H. Dana, Jr., 350 Madison Ave., New York, brick, rein.-con., steel gymnasium addition, incl. athletic field, auditorium, basket ball court, swimming pool, $175,000. G. Hadden, 607 5th Ave., New York, engr.

Ind., Indianapolis—Agricultural Bd. plans by Kopf & Deery, 620 Indiana Pythian Bldg., steel grand stand at Fairgrounds. $225,000.

Mass., Belmont—Town, Bd. Selectmen, new parks, playgrounds. $49,360 appropriated.

Mass., Leominster — Doyle Athletic Field Comn., R. J. Middlemas, plans by M. A. Dyer, 1 Beacon St., Boston, 1 story, brick, concrete field house, Priest St. $25,000-$30,000.

Mass., Winthrop—Town, G. W. Tibbetts, chn. Bd. Selectmen, playground, grading and filling, at Point Shirley. $25,000.

Minn., Rochester—See "Schools."

N. J., Clifton—C. E. Cole, 253 Bellevue Ave., Upper Montclair, preliminary plans 75 x 165 ft., rein.-con. swimming pool, Grove St. $25,000 or more.

N. J., East Orange — Bd. Educ., 19 Winans St., improving stadium at Spring and Morris Sts. $25,000 or more. **Maturity probably soon.**

N. J., North Long Branch—S. A. McNair, 388 Ocean Ave., will not build 1 story, basement, brick, steel bathing pavilion, Ocean Ave. $150,000. Project abandoned. Noted Mar. 5.

N. J., Roselle Park — Union County Park Comn., Acme St., Elizabeth, county park, near Roselle High School Athletic Field. $25,000 or more. Project in abeyance. Private plans. Noted Feb. 12.

N. Y., Saratoga Springs—BOTTLING PLANT —See "Buildings—Unclassified."

Ont., Toronto — City, Parks Dpt., concrete swimming pool, dressing rooms, purification system, circulators, etc., in North Toronto area. $65,000. R. C. Harris, City Hall, engr.

Que., Montreal—City J. E. Gauthier, clk., plans by D. J. Spence, 2063 Union Ave., and soon takes bids rein-con., brick public bath, Wellington St. and Marguerite-Bourgeois St.

BIDS ASKED

Me., Kents Hill—Mar. 20 (extended date), by Maine Wesleyan Seminary & Women's College, T. W. Watkins, and Bunker & Savage, archts., 256 Water St., Augusta, 1 story, brick, 70x120 ft. and 25x100 ft., concrete gymnasium and locker. $70,000. Noted Mar. 12.

Mass., Lynnfield—See "Contracts Awarded."

N. Y., New York—Mar. 24, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, concrete paving, edging, masonry wall, repaving walks in Morningside Park, and erecting field office, in connection with West Side and Riverside Park Impvt., Riverside Dr. near 80th St., Manhattan Boro.

CONTRACTS AWARDED

Mass., Boston—City, Park Dpt., 33 Beacon St., 1 story, brick, concrete locker at Billings Field, West Roxbury, to J. A. Singarella, Park Sq. Bldg., $23,200. Est. exceeds $25,000. Noted Feb. 5.

Mass., Boston—City, Park Dpt., 33 Beacon St., 1 and 3 story, brick, concrete, bath house and laundry at North End Park, plain found., to T. C. Dolan, 43 Tremont St., $107,980. Noted Feb. 19.

Mass., Lynnfield—Kimball Boyd Corp., c/o E. R. Boyd, 35 Maple St., Stoneham, golf course, recreation building, day labor. $100,000. Private plans.

HEATING AND VENTILATING

BIDS ASKED

N. H., Exeter—Mar. 24, by Phillips Exeter Academy, L. Perry, headmaster, constructing, equipping central heating plant. To exceed $25,000. R. D. Kimball Co., 6 Beacon St., Boston, Mass., engrs.

N. J., Holmdel—Mar. 24, by Dpt. Institutions & Agencies, State House, Trenton, ventilating system in Dormitories 17, 18, 24, and 25 at New Jersey State Hospital. $25,000. Div. Architecture & Constr., Trenton, engrs.

N. Y., Flushing—Mar. 23, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating, ventilating, plumbing, drainage, electrical work and electric fixtures for P. S. 24, Holly Ave. from Union to Robinson Sts., for Bd. Educ., 500 Park Ave., New York.

N. Y., New York—Mar. 23, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating, ventilating, plumbing, drainage, electrical work and lighting fixtures in P. S. 103, East 229th St. from Bronx Blvd., to Carpenter Ave., for Bd. Educ., 500 Park Ave.

CONTRACTS AWARDED

Ind., Bloomington—Bd. Trustees Indiana University, J. W. Craven, secy., heating, ventilating in Mens Union Building, 4 story, basement, 100 x 340 ft., rein.-con., limestone, to Freyn Bros., 1020 North Illinois St., Indianapolis, $40,802; electric wiring, to Sanborn Electric Co., 309 East Illinois St., Indianapolis, $10,821; plumbing, to Tibbetts Plumbing, Union City, $20,400; elevators, to Montgomery Elevator Co., Moline, Ill., $11,812. Grand total $83,835. Noted Jan. 1, under "Schools."

Massachusetts—Comrs. Middlesex Co., East Cambridge, heating in recreation building, dormitories, nurses' home at hospital, in Waltham and Lexington, to J. J. Hurley & Co., 104 Broadway, Boston; electrical work, to M. B. Foster Electric Co., 514 Atlantic Ave., Boston; plumbing, to H. J. Lyons Co., 8 Waltham St. Est. exceeds $25,000. Noted Mar. 5 under "Hospitals."

UNCLASSIFIED

PROPOSED WORK

Calif., Los Angeles—BREAKWATER, etc.—City Harbor Dpt., extending fish harbor, incl. construction sheet steel piling with earth fill breakwater, wharves, roadways, lockers. $130,000.

Colorado and Kansas—GAS PIPE LINE—Colorado Natural Gas Co., c/o A. K. Lee, Independence Bldg., Colorado Springs, Colo., soon lets contract 213 mi. 10¾ in. gas pipe line from Hugoton, Kan., to Colorado Springs, Colo. $2,000,000. (Bids opened Mar. 15.)

Mass., Barnstable — MEMORIAL — Town, Building Comn., W. Lowell, chn., war memorial. $25,000. Engineer not selected.

Mass., Braintree — COMFORT STATION — Town, E. Avery, chn. Bd. Selectmen, comfort station on South Braintree Sq., South Braintree. $30,000.

N. J., Jersey City — UNDERPASS — Bd. City Comrs., City Hall, concrete underpass under Journal Sq. $25,000 or more. Project in abeyance. J. Henderson, city engr.

N. Y., New York—FERRY SLIP, etc.—Dpt. Plant & Structures, Municipal Bldg., ferry slip, dock repairs, Whitehall St. To exceed $40,000. **Maturity soon.**

Pa., Avella—COAL WASHING PLANT—Pittsburgh & West Virginia R.R. Co., Wabash Bldg., H. H. Temple, ch. engr., and Pittsburgh Terminal Coal Co., Wabash Bldg., Pittsburgh, soon let contract coal washing plant, siding and tipple, near West Middletown Twp. $500,000.

Texas—OIL PIPE LINE—Magnolia Petroleum Co., Magnolia Bldg., Dallas, and 227 Broadway, San Antonio, preliminary plans 110 mi. 10 in. oil pipe line from Center or Lated, to connect with Smackover or ElDorado line. $850,000. Private plans.

Texas—PIPE LINE—Jim Cloud, Inc., 1245 East 24th Pl., Tulsa, Okla., Dana Oil & Gas Co., Amarillo Bldg., Sunray Oil Corp., 295 Madison Ave., New York, 45 mi. 6 in. welded c.i. pipe line from point near Amarillo to Apache Refining Co. Refinery (to be built soon), at Altman, Moore Co. $100,000. Private plans.

Texas—PIPE LINE—Sinclair Oil Co., 45 Nassau St., New York, plans pipe line from Houston refinery to East Texas oil fields, to exceed $1,000,000; taking bids 265 mi. or 35,000 tons 12 in. pipe for pipe line from Rusk Co., Tex., to Oklahoma City, Okla., and Koffeyville, Kan. line.

Tex., Cotulla—LAND DEVELOPMENT—Los Feliz Investment Co., c/o C. F. Off, 610 South Main St., Los Angeles, Calif., purchased 14,000 acre site and plan developing same, incl. building roads, fencing plots, clearing land, and citrus planting.

BIDS ASKED

La., Winnfield—BREAKER BUILDING—See "Contracts Awarded."

Mo., St. Louis—FIRE ALARM SYSTEMS—Apr. 14, by Bd. P. Serv., City Hall, installing, servicing or installing, rental and servicing Central Station Automatic Fire Alarm Systems in various institutions. $150,000.

N. Y., Buffalo—EXIT STAIRS—Apr. 8, by Dpt. Mental Hygiene, State office Bldg., Albany, constructing and electric work for exit stairs on Ward 16, Buffalo State Hospital; adv. E. N.-R. Mar. 19.

Pa., Phila.—STRUCTURAL STEEL—Mar. 23, by C. E. Walsh, purch. agt. Pennsylvania R.R. Co., 15 South 42nd St., miscellaneous structural steel, Contr. 6—1931.

Pa., Phila.—TRACK FASTENINGS, STRUCTURAL STEEL—Mar. 26, by C. E. Walsh, purch. agt. Pennsylvania R.R. Co., 15 North 32nd St., Contr. 8-193, track fastenings, Contr. 9-1930, structural steel.

Texas—PIPE LINE—See "Proposed Work."

CONTRACTS AWARDED

La., Winnfield — BREAKER BUILDING — Louisiana Development Co., C. R. Walters, supt., subsidiary Cary Mining Interests, Hutchinson, Kan., 8 story, 76x183 ft., steel, rein.-con. breakers building for salt rock mine, own forces.

Montana—PIPE LINE—L. B. O'Neil, Cut Bank, Anaconda Copper Mining Co., C. F. Kelley, pres., Montana Power Co., J. D. Ryan, pres., Butte, signed contracts Feb. 27, for 230 mi. 20 in. welded gas pipe line from Butte to Cut Bank, compressor stations, distributing systems, etc. Main pipe line to be constructed by L. B. O'Neil, supplying systems by Montana Power

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Unclassified (Continued)

Co., H. W. Parmalee, Cut Bank, engr. $12,000,000.

N. J., Newark — GRADING, etc. — North Jersey Dist. Water Supply, Comn., 24 Commerce St., grading, concrete work at Raymond Dam, Boro Wanaque, to W. E. Williams, 109 Royal Ave., Hawthorne; sodding and shrubs, to Hoverman Bros., Paramus. Est. $25,000 or more. Noted Feb. 5.

N. Y., Long Island City—ELEVATOR—Garden Estates, 18 East 18th St., New York, altering apartment for elevators, Middlebury and Fitting Aves., to Otis Elevator Co., 41-25 29th St. Est. $75,000.

MATERIALS

PROPOSED WORK

PIPE—**Los Angeles, Calif.**—Bd. P. Wks., City Hall, rejected bids 20,000 ft. 12 in. pipe.

BIDS ASKED

CONCRETE BRICK, etc.—**Little Rock, Ark.**—Mar. 26, by Arkansas Constr. Comn., J. M. Hill, chn., portland cement, second unit; face and common brick, second unit; hollow tile, second unit; refrigerating equipment for units, 1, 2 and 8, for State Hospital for Nervous Diseases, Saline Co. Mann, Wanger & King, 1316 Donaghey Bldg., archts.

POWER POLES — **Gridley, Calif.** — City Trustees bids about Mar. 23, carload power poles for Municipal Power Dpt.

CEDAR POSTS—**Quincy, Calif.**—Apr. 6, by Bd. Supervs. Plumas Co., ten thousand 6 in. x 7 ft. heart cedar posts.

ASPHALTIC ROAD OIL—**Hartford, Conn.**—Mar. 31, by Bd. Contr. & Supply, J. S. Bush, secy., 90,000 gal. more or less 45 to 55% asphaltic road oil. Bidders will quote on 82,000 gal. furnished and applied as directed on any street, and on 8,000 gal. delivered to city distributing wagons, otherwise in tank car f.o.b. Hartford; adv. E. N.-R. Mar. 19.

CULVERT PIPE, GRAVEL, etc.—**Ft. Madison, Ia.**—Mar. 24, at office Auditor Lee Co., various sized corrugated culvert pipe at various shipping points, also 8,000 tons gravel placed on Mooar-Argyle Rd., grading 20 mi. roads.

CULVERT PIPE—**Rock Rapids, Ia.**—Mar. 24, at office Auditor Lyon Co., 1,168 lin.ft. 18 in., 414 lin.ft. 24 in., 144 lin.ft. 30 in., 276 lin.ft. 36 in. rein.-con. culvert pipe.

STEAM CINDERS—**Brooklyn, N. Y.**—Mar. 25, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, 10,000 cu.yd. steam cinders; 400,000 gal. asphalt road oil for cold application; 75,000 grade 1 standard 5 in. granite paving blocks.

WATERMETERS—**Wahpeton, N. D.**—Mar. 23, by A. H. Miller, city aud., 700 watermeters, G. M. Orr & Co., 408 Baker Bldg., Minneapolis, Minn., engrs.

TAR—**Cincinnati, O.**—Mar. 20, by Comrs. Hamilton Co., 500,000 gal. Grade 1 tar, for road repair work. E. A. Gast, Court House, engr. $60,000.

COLD PATCH, TARVIA, etc.—**Cleveland, O.**—Mar. 24, by Bd. Comrs. Cuyahoga Co., 4,000 gal. cold patch, 42,000 gal. tarvia, 2,000 tons slag or stone, 3,000 tons screened stone or slag chips.

CEMENT, ASPHALT, etc.—**Wilkes-Barre, Pa.**—Mar. 24, by Bd. Comrs. Luzerne Co., portland cement, natural rock asphalt, calcium chloride, concrete pipe for 1931. R. L. Williams, Wilkes-Barre, engr.

ROAD OIL—**Wilker-Barre, Pa.**—Apr. 7, by H. Weiss, city clk., road oil in car load lots during 1931 on basis 50,000 gal.

LIMESTONE, GRAVEL, STEEL, etc.—**Memphis, Tenn.**—Mar. 23, by Bd. Comrs. Shelby Co., Court House, E. W. Hale, ch., crushed limestone, road gravel, concrete and binder gravel, sand, cement, steel, culvert pipe, nails, untreated lumber, preserving treated lumber, and piling (creosoted, etc.), bituminous materials.

CONTRACTS AWARDED

CAST IRON PIPE—**Long Beach, Calif.**—City, 79,200 ft. 2 in. and 10,000 ft. 20 in. c.i. pipe in 12 ft. lengths, to U. S. Pipe & Fdry. Co., 2326 East 8th St., Los Angeles, $75,492.

WATER PIPE—**Los Angeles, Calif.**—Bd. P. Wks., City Hall, 60,000 ft. 8 in. water pipe, 20,000 ft. delivered on 1st days of April, May and June, to Utilities Equipment Corp., Los Angeles, at $0.965 per ft.

TROLLEY WIRE—**San Francisco, Calif.**—City, c/o L. S. Leavey, purch. agt., 4 mi. 3/0 round high strength copper trolley wire for Municipal Railways (2,674 lb. per mi. in weight), to General Electric Supply Corp., 1201 Bryant St., San Francisco, at $20.88 per 100 lb allowing $20 each reel. Noted Feb. 19.

CABLE—**Hartford, Conn.**—Bd. Contr. & Supply, 16,000 ft. No. 10 and 1,000 ft. No. 25 conductor wire lead cable, to Graybar Electric Co., Inc., 51 Chapel St., $2,490.

ASPHALT, BRICK, etc.—**Indianapolis, Ind.**—Bd. P. Wks., A. H. Losche, purch. agt., asphalt, to Standard Oil Co., 137 West 11th St.; gravel to Brown & Huffstetter Material Co., 1735 Kentucky Ave.; brick, to F. M. Dell, 1001 Southeastern St.; cut back asphalt, to Shell Petroleum Co., 2219 West Michigan Ave. Total $32,748.

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CRUSHED STONE—**Boston, Mass.**—City, Supply Dpt., P. A. Chapman, supt., furnishing crushed stone to various city departments, as required until Dec. 31, to West Roxbury Trap Rock Co., 10 Grove St., West Roxbury, at $1.55 to $1.75 per ton.

EDGESTONES—**Boston, Mass.**—City, Supply Dpt., granite edgestones, to H. E. Fletcher Co., West Chelmsford. $77,750.

SEWER BRICKS—**Boston, Mass.**—Supply Dpt., furnishing, 325,000 sewer bricks, to J. P. O'Connell, 104 Forsyth St., at $15.45 per 1,000, total $5,021.

PIPE, etc.—**Kenosha, Wis.**—City, 210 tons c.i. water pipe, to Lynchburg Fdry. Co., 122 South Michigan Blvd., Chicago, Ill., at $45 per ton; 7 tons c.i. fittings, to Traverse City Iron Wks., Traverse City, Mich., $90; 25 tons pig lead, to Lewin Metals Corp., 432 Barclay St., Milwaukee, $2,210; 150 tons sulphate of alumina, to Merchants Chemical Co., 420 Barclay St., Milwaukee, at $1.22 per 100 lb.

EQUIPMENT

PROPOSED WORK

TRACTOR, GRADER, etc.—**Huntington, Ind.**—Bd. City Comrs. soon takes bids 25 hp. 10,000 lb. tractor, 9 ft. blade, 8,000 lb. grader, $3,000. E. Collins, Huntington, engr.

BIDS ASKED

LAUNDRY MACHINERY—**Evansville, Ind.**—Apr. 6, by Bd. Comrs. Vanderburgh Co. laundry machinery (new and rebuilt) for Asylum for the Poor. $5,500. A. E. Neucks, Old Natl. Bank Bldg., archt.

TANKS—**Leominster, Mass.**—Leominster Fuel Co., 49 Main St., in market three 15,000 gal. tanks for fuel oil storage.

GRADER—**Mora, Minn.**—Mar. 24, by G. G. Billstrom, aud. Kanabec Co., 1 road patrol grader 12 or 14 foot blade.

ROAD ROLLER—**Englewood, N. J.**—Bd. City Council, Municipal Bldg., 1 steam road roller with scarifier for road work. $5,200. G. R. Hartley, city engr.

AIR COMPRESSOR, etc.—**New York, N. Y.**—Mar. 25, by P. J. Dooling, comr. Purchase, Municipal Bldg., furnishing, delivering air compressor, centrifugal pump to Dpt. Water Supply, Gas & Electricity.

ENGINE and GENERATOR—**Pawhuska, Okla.**—City, P. J. Monk, mayor, in market 750 hp. Diesel engine and generator.

SUB-STATION EQUIPMENT—**Oakmont, Pa.**—Duquesne Light Co., 435 6th Ave., Pittsburgh, C. W. Lepper, purch. agt., in market equipment for new sub-station and vaults.

TRUCKS—**Wilkes-Barre, Pa.**—Mar. 31, by Bd. Comrs. Luzerne Co., two 3 to 3½ ton motor trucks designed to carry 6 ton load, mounted with cab and 3½ cu.yd. capacity steel dump body using underbody hoist, pneumatic tires, 4-wheel brakes. $8,000.

MOTOR TRUCK CHASSIS—**Toronto, Ont.**—Mar. 24, by W. J. Stewart, mayor, City Hall, 10 motor truck chassis, four 3½ ton gasoline trucks and six 5 ton gasoline truck chassis. $20,000. R. C. Harris, City Hall, engr.

FOREIGN

Chile, Santiago—Apr. 1, by Empresa de Auga Potable de Santiago 60,000 meters c.i. pipe in various sizes, 50 mm. to 450 mm. inside diam.

England, Birmingham — Paramount Publix Theatres, c/o Foreign Theatres Dpt., Paramount Bldg., New York, plans motion picture theatre. To exceed $500,000. **Maturity indefinite.**

England, Newcastle—Paramount Publix Co., c/o Foreign Theatres Corp., Paramount Bldg., New York, plans theatre. To exceed $500,000. **Maturity indefinite.**

Ireland, Belfast—Paramount Publix Theatres, c/o Foreign Theatres Dpt., Paramount Bldg., New York, plans motion picture theatre. To exceed $500,000. **Maturity indefinite.**

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Calif., San Mateo—W. Lowe, archt., 354 Hobart St., Oakland, taking bids 6 story, basement, steel, concrete, brick, 3rd St., for Irma Downing, 212 South El Camino Real. $250,000.

Conn., Hartford — R. Collat, c/o A. Gross, 1003 Main St., taking bids 4 story, brick, limestone, South Hudson St. $150,000. Private plans.

Mass., Brookline—Mar. 31, by A. H. Dow, archt., 192 Boylston St., Boston, two 3 story, basement, 100 x 120 ft., brick apartment units, plain founds., Warren St., for Owner, c/o architect. $350,000. Architect takes separate bids for heating, plumbing and electrical work, later.

N. J., Asbury Park—See "Contracts Awarded."

N. Y., Avon (Jamaica P. O.)—See "Contracts Awarded."

N. J., South Orange — See "Contracts Awarded."

N. Y., Astoria—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Jamaica—See "Contracts Awarded."

N. Y., Long Island City — See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N, Y., St. Albans—See "Contracts Awarded"

N. Y., Woodside—See "Contracts Awarded."

Pa., Mt. Lebanon—S. A. Marstellar, archt., 246 3rd Ave., taking bids 3 story, basement, brick, steel efficiency apartment, Academy Ave. $150,000.

Tex., Henderson—F. R. Hodges & Associates, Henderson, soon lets contract 4 story, brick, rein.-con. addition to Hotel Randolph. $150,000. Jones, Roessle, Olschner & Weiner, Shreveport, La., archts.

Wash., Seattle — E. W. Morrison, archt., Lloyd Bldg., bids about Apr. 10, 6 story apartment hotel, and 25 x 75 ft. heated swimming pool, Alki Ave., for West Side Development Co., White Henry Bldg. Est. $340,000.

Wis., Milwaukee—M. F. Pfaller, engr., Wauwatosa, taking bids 6 story, 130 x 150 ft., brick, apartment, store, 12th St., for Mayflower Investment Co., c/o Engineer.

CONTRACTS AWARDED

N. J., Asbury Park—B. Katz, 31 Wegeman Parkway, Jersey City, 5 story, basement, 65 x 145 ft., brick, steel, Emery St., separate contracts. $150,000. P. Freshman, 50 Court St., Brooklyn, archt.

N. J., South Orange — Morris Mandelbaum Associates, 7 East 42nd St., New York, 2 and 3 story, basement, brick, steel, Irvington Ave. from Kilburn Pl. and Normandy Court, separate contracts. $350,000. Harris & Sohn, 17 Mechanic St., Newark, archts. Noted Oct. 30, under "Contracts Awarded."

N. Y., Astoria—W. J. I. Building Corp., 3111 30th Ave., 6 story, 90 x 100 ft., 28th Ave. and 36th St., separate contracts and day labor. $150,000. C. Marsac, 31-06 30th Ave., archt.

N. Y., Astoria—Webham Realty Corp., 35-10 Bway., apartment, 47th St. and 28th Ave., separate contracts. $200,000. Private plans.

N. Y., Avon (Jamaica P. O.)—Berkeley Homes, Inc., Chamber of Commerce Bldg., Jamaica, Grand Central Parkway and vicinity, separate contracts. A. Farber, c/o owner, archt. $150,000.

N. Y., Brooklyn—Big Two Realty Corp., L. Posner, secy., 16 Court St., 6 story, Lefferts Ave., separate contracts. $325,000. Cohn Bros., 215 Montague St., archts.

N. Y., Brooklyn—Fauro Realty Corp., M. Adelman, pres., 5220 Tilden Ave., 4 story, East 52nd St. and Tilden Ave., separate contracts. $150,000. M. Hirsch, 350 Stone Ave., archt.

N. Y., Brooklyn—Hendrickson Building Co., A. Paulmbo, pres., 44 Court St., 6 story, Westminster and Dorchester Rds., separate contracts. $150,000 M. W. Del Gaudio, 545 5th Ave., New York, archt.

N. Y., Brooklyn—Oceanside Constr. Co., 186 Joralemon St., 6 story apartment, Clarkson and Bedford Aves., separate contracts. $250,000. J. Tabalchink, 3-2 Court St., archt.

N. Y., Brooklyn—Scheckner Realty Co., 1030 Park Pl., 6 story, basement, brick, steel, Brooklyn Ave., separate contracts. $300,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Brooklyn—J. Scilepi, 2620 Glenwood Rd., 6 story apartment, East 27th St. and Glenwood Rd., separate contracts. $200,000. Cohn Bros., 215 Montague St., archt.

N. Y., Jamaica—One Hundred Forty-Forth Street, Inc., 110-18 Jamaica Ave., Richmond Hill, 6 story, 84 x 90 ft., 144th St. and Jamaica Ave., separate contracts. $203,000. H. T. Jeffery, Jr., 90-50 Parsons Blvd., archt.

N. Y., Long Island City—L. Einsidler, 73-16 Roosevelt Blvd., Jackson Heights, apartment, Patterson Ave. from 87th to 88th Sts., separate contracts. $150,000. J. Galloway, 74-05 Bway., Jackson Heights, archt.

N. Y., Long Island City—Krogolif Building Corp., 60-19 Roosevelt Ave., Woodside, 6 story, basement, brick, steel, 27th St. and 37th Ave., separate contracts. $150,000. C. Marsac, 31-06 30th Ave., Astoria, archt.

N. Y., New York—Housing Constr. Corp., 415 Lexington Ave., 6 story, 182 East 3rd St., separate contracts. $250,000. H. Ginsberg, 205 East 42nd St., archt.

N. Y., New York—J. Sloan, 575 5th Ave., 5 story, basement apartment, 48 East 92nd St., to Hegeman Harris Co., 360 Madison Ave. Est. $150,000. General contractor will take separate contract bids about Apr. 1.

N. Y., St. Albans—Fitchett Holding Corp., Leslie Rd., apartment, 178th Pl. and 120th Ave., separate contracts. $150,000. Private plans.

N. Y., Woodside—Briegen-Localzo & Haddard, 59-26 Woodside Ave., 6 story, 60 x 84 ft., 65th Pl. and Woodside Ave., separate contracts. $150,000. W. Hohauser, 17 West 44th St., New York, archt.

N. Y., Woodside—J. Stankewick, 40-45 74th St., Jackson Heights, 4 story, 41st Ave. and 58th St., separate contracts. $150,000. Private plans.

Okla., Oklahoma City—Skirvin Hotel Co., W. B. Skirvin, owner, excavation and caisson found. contracts 2 story, basement, 100 x 140 ft., brick steel hotel to L. Sanders Tradesmens

Residential (Continued)

Bldg., Oklahoma City. $65,000. Noted Dec. 18, under "Contracts Awarded."

Wis., Milwaukee—Owner, c/o M. Tullgren & Sons Co., archts., 20 Prospect Ave., concrete and masonry for 9 story, basement, 40 x 130 ft., brick, steel, Kane St., to P. Riesen's Sons Co., 2660 North Humboldt St.

Ont., Hamilton—Royal Connaught Hotel Co., King St. E., W. J. Southam, pres., excavation for 14 story, basement, brick, steel, stone hotel addition, to A. Cope & Sons Ltd., 19 Albert St.; structural steel, to Hamilton Bridge Co. Ltd., Bay St. N. Total est. $1,000,000. Noted Mar. 5, under "Contracts Awarded."

CLUBS

PROPOSED WORK

N. J., Clifton—B.P.O.E., F. A. Latimer, 725 Clifton Ave., will not build 2 story, basement, brick, steel club addition, Clifton Ave. Project abandoned. Noted Feb. 5.

N. J., Long Branch—Young Men's Progressive Assn., c/o Commercial Hotel, 149 Bway., 2 brick, steel solariums, Ocean front and Bath Ave. $200,000. **Maturity probably soon.**

BIDS ASKED

Conn., Manchester—Y.M.C.A., W. A. Strickland, chn. building, com., bids about Apr. 1, general contract Y.M.C.A. additions, community club, library unit, etc. all brick, steel, stone, $150,000. Hutchins & French, 11 Beacon St., Boston, Mass., anr Architectural Bureau Y.M.C.A., 347 Madison Ave., New York, archts.

N. J., Newark—Italian Catholic Club and J. Centanni, archt., 142 Market St., bids about Apr. 1, general contract 3 story, basement, brick, steel, Summer Ave. $150,000. Noted Jan. 22.

HOSPITALS

PROPOSED WORK

Ariz., Phoenix — Maricopa Co., c/o County Clerk, hospital. $678,400.

Conn., Hartford—Hartford Hospital, L. K. Sexton, supt., plans by Kendall, Taylor & Co., 209 Columbus Ave., Boston, Mass., and takes bids latter part month, 3 story, brick, steel nurses home and swimming pool, South Hudson St. $150,000. Noted Dec. 4.

Mass., Mattapan (sta. Boston)—City of Boston, Hospital Dpt., hospital unit, River St. $700,000. Architect not selected.

Mass., Norfolk — Commonwealth of Massachusetts, Dpt. Correction, State House, Boston, plans by McLaughlin & Burr, 88 Tremont St., Boston, brick administration building, $150,000; also brick kitchen service building, laundry, cell block at State Prison Colony. $150,000 or more.

N. J., Hackensack — Hackensack Hospital, G. G. Ackerson, pres., 3rd St., brick, steel addition, 3rd St. $450,000. **Maturity probably soon.**

N. J., Hasbrouck Heights—Hasbrouck Heights Hospital, H. K. Cohan, supt., 272 Columbus Ave., sketches 3 story, basement, 100 x 112 ft., brick, steel hospital, Columbus Ave. $150,000.

N. J., Long Branch—E. C. Hazard Hospital, E. C. Hazard, chn., 81 Washington St., 10 story, basement, brick, steel, Washington Ave. and Dewey St. $500,000. **Maturity about June.** Architect not selected. Noted Jan. 22.

N. J., Point Pleasant — Point Pleasant Hospital will not build 3 story, basement hospital addition. $150,000. Project abandoned. Noted June 19.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., contagious ward building at Riverside Hospital, North Brother Island. $500,000. **Maturity in early summer.** Schwartz & Gross, 347 5th Ave., archts. Noted Jan. 1.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., nurses home addition, Welfare Island. $500,000. Schwartz & Gross, 347 5th Ave., archts. **Maturity about June 1.** Noted Jan. 8.

O., Cleveland—Huron Road Hospital, S. C. Runnels, supt., 8811 Euclid Ave., soon lets contract 6 story, basement, brick, steel, concrete, Belmore and Terrace Rds. $900,000. George S. Rider Co., Marshall Bldg., archts.

Pa., Sayre—Robert Packer Hospital, sketches 7 story, basement, 30 x 282 ft., rein.-con., brick, steel addition, plain found., Packer Ave. $250,000.

Ont., London—John M. Moore & Co., archts., 489 Richmond St., soon lets contract 3 story, 45 x 200 ft. addition to Parkwood Hospital. $150,000. Noted Jan. 8.

Que., Montreal—Bd. Trustees Montreal Jewish Hospital, A. Bronfman and M. Hirsh, 1117 Ste. Catherine St. W., plans by J. C. McDougall, 1221 Osborne St., in association with D. Goodman, 1135 Bleury St., with S. S. Goldwater of New York City as consultant, and takes bids in May, hospital, Cote des Neiges and Cote Ste. Catherine Rds. $1,000,000. Noted Feb. 27, 1930.

BIDS ASKED

Mass., Mattapan (sta. Boston)—Mar. 31, by City of Boston, Hospital Dpt., 2 story, basement, brick, stone recreation building at hospital, plain found. $150,000 or more. J. H. Ritchie & Associates, 250 Stuart St., Boston, archts.

N. J., Holmdel—Mar. 24 (extended date), by Dpt. Institutions & Agencies, State Office Bldg., Trenton, 4 story, basement, 230 x 395 ft., brick, steel, rein.-con. reception and treatment hospital, New Jersey State Hospital. $1,000,000. Div. Architecture & Constr., State Office Bldg., Trenton, archt. Noted Mar. 5.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., bids about Apr. 15, male dormitory, at Fordham Hospital. $150,000. R. Swartburg, 2 West 46th St., archt.

CONTRACTS AWARDED

Calif., Los Angeles—Los Angeles Co., Travertite (art stone) contract for Acute Unit of County Hospital, to P. Grassi & Co., 1045 San Bruno Ave., San Francisco. $438,720. Noted Oct. 9.

Ia., Davenport—Schmidt, Garden & Erickson, archts., 104 South Michigan Ave., Chicago, Ill., general contract 5 story, basement, 73 x 233 ft., rein.-con., brick addition for Sisters of Mercy, to Tunnicliff Constr. Co., Davenport; plumbing and heating, to Ideal Plumbing & Heating Co., Davenport. Est. $300,000. Noted Feb. 5.

Pa., Byberry—Dpt. Pub. Health, City Hall, c/o A. A. Cairns, general contract 2 story, basement, 30 x 50 ft. and 38 x 164 ft. physicians building, 2½ story, basement, 79 x 162 ft. infirmary, 3 story, basement, 27 x 32 ft. and 38 x 151 ft. female attendants building, all rein.-con., brick, steel, plain found., to McCormick & Lenham, 40th and Chestnut Sts., $358,883; plumbing, to D. J. Keating, 613 South 24th St., $52,554; heating to S. Faith Co., 347 12th St., $38,012. Grand total $449,449. Noted Mar. 5.

Pa., Phila. — Zantzinger, Borie & Medary, archts., Architects Bldg., 7 story, basement, 56 x 111 ft. and 44 x 47 ft. rein.-con., brick, steel hospital, plain found., to Cramp Co., Denckla Bldg., for Women's Hospital, Preston and Parrish Sts., G. H. Earl, pres. Building Comn. Est. $600,000. Noted Feb. 19.

Wis., Milwaukee—Milwaukee Hospital, general contract 5 and 6 story, 90 x 100 ft. brick, rein.-con., limestone, to Dahlman Constr. Co., 456 Bway. Est. $400,000. Noted Jan. 8.

CHURCHES

PROPOSED WORK

Calif., Santa Barbara—Theologate of Society of Jesus plans by Dougan & Reverman, Kraemer Bldg., Portland, Ore., 3 story, 44 x 520 ft., rein.-con. lecture hall.

Conn., Bridgeport—St. Thomas Parish, W. J. Blake, pastor, soon lets contract 1 story, basement, 55 x 100 ft., brick, stone parish hall. $150,000. W. Schmidt, 144 Golden Hill St., archt.

Mass., Springfield — Hope Congregational Church, F. Seybolt, chn. building comn., sketches by B. Hammett Seabury Co., 21 Bess Pl., rebuilding church, destroyed by fire., State St. $150,000.

N. J., Newark—Roman Catholic Diocese, 22 Mulberry St., sketches by Fanning & Shaw, 49 Ward St., Paterson, 4 story, basement, brick, steel chancery building, 31 Mulberry St. $150,000.

N. J., Paterson—St. Paul's Church, D. S. Hamilton, pastor, 452 Van Houten St., will not build 2 story, basement, brick, steel parish house, Van Houten St. $150,000. Project abandoned. Noted Dec. 11.

N. J., Red Bank—First Methodist Church of Red Bank, F. A. DeMaris, rector, 3 story, basement, brick, steel church, Broad St. and LeRoy Pl. $250,000. Project in abeyance. N. Hulme, 1524 Chestnut St., Phila., Pa., archt. Noted Jan. 29.

N. J., Woodridge (br. Rutherford) — First Presbyterian Church, R. H. Hughes, pastor, 430 Highland Ave., 2 story, basement, brick, steel church, North Ave. and 3rd St. $150,000. **Maturity probably in June.** Noted Mar. 12.

Pa., Mt. Lebanon — St. Bernards Roman Catholic Congregation, T. H. Bryson, pastor, 311 Washington Rd., stone church, 415 Washington Rd. $700,000. **Maturity probably in 1932.** Architect not selected.

Que., L'Ange Gardien—H. Laberge, archt., 140 St. John St., Quebec City, rebuilding, preparing plans and soon takes bids brick, rein.-con., plain found. for L. Piches. $150,000—$200,000.

Que., Rigaud—Congregation of Sisters of St. Francis, 6798 Drolet St., Montreal, bids early in April, 4 story, 132 x 140 ft., rein-con., brick convent. J. S. Bergeron, 143 St. John St., Quebec City, archt. Noted Mar. 12.

BIDS ASKED

Calif., San Francisco—Shea & Shea, archts., 454 Montgomery St., taking bids Class A rein-con. church, Funston Ave., for Roman Catholic Archbishop, 110 Franklin St. Noted Sept. 25.

N. J., Newark—W. Bayard Willis, archt., 111 Madison Ave., New York, bids about May 1, general contract rebuilding 2 story, basement, brick, steel church, James and Washington Sts., for Second Presbyterian Church, L. H. Cree, pastor, 294 Mount Prospect St. $250,000. Noted Mar. 5.

N. J., Newark—Roman Catholic Diocese, 22 Mulberry St., bids about May 1, general contract 4 story, basement, brick, steel chancery building, 31 Mulberry St. $150,000. Fanning & Shaw, 49 Ward St., Paterson, archts. Noted Mar. 19.

CONTRACTS AWARDED

Calif., Alhambra—Church of Jesus Christ of Latter Day Saints brick, stone church, to L. Bowers, 5363 Edna St., Los Angeles, $150,000.

Mass., Somerville (br. Boston)—St. Polycarp's Roman Catholic Church, J. E. O'Connell, pastor, 65 Temple St., and O'Connell & Shaw, archts., 134 Newbury St., Boston, 1 story, basement, granite church, to J. J. Powers Co., 33 Myrtle St., Cambridge. Est. $150,000. Noted Jan. 23.

N. J., Keyport—Calvary Methodist Episcopal Church, general contract altering and constructing 2 story, basement, brick, steel addition, to Kruser & Reinhold, Keyport. Est. $150,000. Noted Feb. 25 Daily.

SCHOOLS

PROPOSED WORK

Conn., Waterbury — Sacred Heart Roman Catholic Church, J. J. Fitzgerald, Wolcott St. pastor, sketches by T. M. Feeney, 51 Leavenworth St., convent. $150,000 or more.

Conn., Willimantic—Town of Windham, E. A. Case, supt. schools, plans by W. Potter, 22 East 17th St., New York, and takes bids about May 1, 2 story, basement, brick high school addition, High and Prospect Sts. $150,000. Noted Mar. 12.

Ind., Greencastle—De Pauw University plans by R. F. Daggett, 923 Continental Bank Bldg., Indianapolis, steel, stone recitation hall, on campus. $250,000.

La., New Orleans—Bd. Educ. bids early in April, Allen Elementary School, 3 story, 90 x 170 ft., rein-con., brick, stone. $150,000. E. A. Christy, City Hall Annex, archt.

La., New Orleans—E. H. Christy, archt., City Hall Annex, soon takes bids Junior High School, for Orleans Parish School Bd. $200,000.

Mass., Boston—Commonwealth of Massachusetts, Dpt. Educ.—Nautical School, 14 Beacon St., sketches Nautical Training School, 2 story, brick, Charles River Basin and Leehmere Canal, $1,000,000. J. Spofford, 53 State St., engr.

Mass., Cambridge—Harvard University, Cambridge, and 61 Bway., New York, and C. O. Boyd, 26 Bway., New York, International House, Charles River Rd. and Amherst St. To exceed $150,000. Architect not selected.

Mass., Everett — City, Schoolhouse Building Comn., P. Dorn, sketches by Desmond & Lord, 1 Beacon St., Boston, 2 story, basement, brick addition to Junior High School, Broadway. $50,000. Noted Nov. 13.

Mass., Everett—City, Schoolhouse Building Comn., P. Dorn, sketches by Desmond & Lord, 1 Beacon St., Boston, 2 story, basement, brick, Locust St. $150,000. Noted Feb. 19.

Mass., Medford (br. Boston)—Tufts College, J. A. Cousens, pres., soon takes bids 2 and 3 story, basement, brick, steel, irregular sized gymnasium, plain found., college grounds, $750,000. Andrews, Jones, Bisco & Whitmore, 50 Congress St., Boston, archts. J. R. Worcester Co., 79 Milk St., Boston, engrs.

Mass., Milford—Town, A. O. Caswell, supt. schools, 2 story, basement, brick school, Fountain St. Dist. $150,000. Architect not selected.

Mass., Millis—L. Allen, supt. schools, sketches by Mowl & Rand, 21 School St., Boston, altering and constructing 2 story, basement, brick high school addition. $150,000. Noted Mar. 12.

Mass., South Hadley — Town, School Bd., plans by M. Maloney, 23 Pearl St., Springfield, brick, School and Carew Sts. $150,000. **Maturity in spring.**

Mass., Watertown—Town, Bd. Selectmen, E. J. Furber, 2 story, basement, brick school, Lexington St. To exceed $150,000. Architect not selected.

Minn., Rochester—Sisters of St. Francis plans by J. H. Miller, Rochester, 2 story, basement, brick, stone, terra cotta, rein.-con. school addition, swimming pool. $225,000.

N. J., Englewood—Bd. Educ., 11 Engle St., plans by L. C. Licht, 4 Dean St., 2 story, basement, brick, steel high school, Knickerbocker Rd. $800,000. Noted Feb. 26.

N. J., Fairview — Bd. Educ., O. Kuenzler, Lincoln School, will not build 2 story, basement, brick, steel grade and high school. $150,000 or more. Project abandoned. Noted Feb. 26.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., altering and constructing 2 story, basement, brick, steel addition, Grove St. $150,000. **Maturity probably in June.** Schneider & Kleeman & Werther, 1007 Broad St., Newark, archts. Noted Mar. 5.

N. J., Lyndhurst (br. Rutherford) — Bd. Educ., High School, 2 story, basement, brick, steel addition to Washington School Ridge Rd. $200,000. **Maturity in May.** Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Jan. 29.

N. J., Maywood—Joint Bd. Educ., of Rochelle Park, Saddle River Twp., and Maywood, Municipal Bldg., 3 story, basement, brick, steel, rein.-con., regional high school. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Middlebush—Bd. Educ., Franklin Twp., 2 story, basement, brick, steel school, plain found. $150,000. **Maturity probably in June.** Architect not selected. Noted Feb. 26.

N. J., Newark—Bd. Educ., City Hall, 3 story, basement, brick, steel addition to Burnett Street School, 37-47 Eagles St. $150,000 or more. Architect not selected. Project in abeyance. Noted Mar. 5.

N. J., Oakhurst—Bd. Educ. Ocean Twp., 2 story, basement, brick, steel school addition. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Peapeck—Bd. Educ. of Boro Peapeck-Gladstone, Main St., plans by A. Merchant, 1 Elm Row, New Brunswick, 2 story, basement, brick, steel addition. $150,000.

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Schools (Continued)

N. J., Perth Amboy—Church of Our Lady of Hungary, L. Horvath, pastor, 697 Cortland St., 2 story, basement, brick, steel school, Cortland St. $150,000. **Maturity probably soon.**

N. J., Ridgefield Park—Bd. Educ. Overpeck Twp., G. Noethling, dist. clk., 2 story, basement, brick, steel addition, Teaneck Rd. $150,000. Project in abeyance. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted Feb. 21.

N. J., Ridgewood — Bd. Educ., J. Kollmar, secy., School 1, Beech St., Junior and Senior High School, 2 story, basement, brick, steel, rein.-con. $150,000 or more. **Maturity probably soon.**

N. J., Teaneck—Bd. Educ., High School Bldg., 3 story, basement, brick, steel addition to high school Queens Ann Rd. $600,000. **Maturity probably in April.** Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted Feb. 19.

N. J., Woodbridge—Bd. Educ., Barron Ave., sketches by Jensen & Rasmussen, 218 Smith St., 2 story, basement, brick, steel school, Strawberry Hill Ave. $150,000. Noted Mar. 5.

N. Y., Cheektowaga (mail Depew)—School Dist. 11, reconstructing school, Delavan Ave. and Andrew St. $185,000.

N. Y., Grymes Hill (mail Staten Island)—Academy of Our Lady of Blessed Sacrament, 2 story high school, Howard Ave. $150,000. Project in abeyance. Noted Feb. 26.

N. Y., New York—General Theological Seminary of Protestant Episcopal Church, 175 9th Ave., plans by E. L. Ttilton, 420 Lexington Ave., 5 story, 66 x 96 ft. school, assembly, 175 9th Ave. $165,000.

N. Y., Syracuse—City grade school, Grant Blvd., $240,000; grade school, south east end city, $150,000. W. W. Cronin, State Tower Bldg., engr.

N. Y., Troy—City, C. F. Burns, mayor, high school. **Maturity indefinite.** Architect not selected.

O., Bucyrus—Bd. Educ., revised plans by W. Unger, Bucyrus, altering and constructing four 2 story, basement, 67 x 83 ft. brick, steel, concrete school additions. $150,000.

Pa., Brentwood—W. P. Hutchins, archt., Empire Bldg., Pittsburgh, soon lets contract 8 story, basement, 34 x 117 ft., brick, limestone, rein.-con. school Brownsville Rd. and Willocks St., for St. Sylvesters Roman Catholic Congregation, c/o architects. $150,000.

R. I., Bristol — Town, E. S. Mapes, supt. schools, 2 story, basement, brick school. $150,000. Architect not selected.

R. I., Providence—City, Dpt. P. Buildings, 2 Senior High Schools. To exceed $150,000. T. J. H. Pierce, City Hall, archt.

Tex., Dumas—Bd. Educ. plans by G. A. Carlander, 1015 Fisk Medical & Professional Bldg., Amarillo, fireproof school. $150,000 bonds voted for same.

Ont., Toronto—Bd. Educ., 155 College St., plans by C. Dyson, 155 College St., 3 story, basement, steel, concrete, stone, brick, on Edith Groves site. $345,000.

BIDS ASKED

Ind., Indianapolis—Mar. 24, by Bd. School Comrs., A. B. Good, dir., 150 North Meridian St., Grade School 56, rein.-con., brick, 24th and Martindale Sts. $150,000. D. A. Bohlen & Son, 1001 Majestic Bldg., archt. C. R. Ammerman, 925 Continental Bank Bldg., engr. Noted Feb. 12.

Ind., St. Meinard—St. Meinard College, E. Beirheide, pastor, bids about Apr. 1, rein-con., stone, hollow tile college, chapel, dormitory, $150,000. Crowe & Schulte, 2436 Reading Rd., Cincinnati, O., archts. Noted Jan. 8.

Ky., Greensdale—Mar. 25, by Bd. Charities & Correction, at office H. A. Churchill & J. T. Gillig, archts., Fayette Bank Bldg., Lexington, school at Kentucky Houses of Reform. J. C. Bird, comr. Public Institutions; also crushed stone, cement, sand, brick, concrete floor hardener, reinforcing steel, steel joists, sheet metal and roofing, mill work, lumber, wood flooring, structural steel, steel sash, glass and glazing, painting, miscellaneous and ornamental iron, metal lath, cut stone, caulking, metal, plastering.

La., Baton Rouge—Louisiana State University, J. M. Smith, pres., bids about Apr. 15, 3 story, basement, 240 x 432 ft., rein.-con., brick, stucco women's dormitory, incl. small gymnasium, laundry, kitchenette, small infirmary. $500,000. Weiss, Dreyfous & Seiferth Maison Blanche Bldg., New Orleans, and Wogan & Bernard, Old Reymond Bldg., archts. Noted Feb. 5.

Md., Baltimore—Mar. 26, at Bd. Awards, 2 story, brick, steel School Addition No. 20, Eden and Federal Sts. F. A. Fletcher, 517 North Charles St., archt. Kubitz & Koenig, Emerson Tower, engrs.

Mass., Marlboro—Mar. 27, by Town, A. A. Martel, chn. com., and M. A. Dyer Co., archts., 1 Beacon St., Boston, 2 story, basement, brick, stone, school, plain found., Hildreth St. $200,000.

Minn., Minneapolis—Mar. 25, by Bd. Educ., 305 City Hall, 2 story, basement, brick, steel, Nicollet Ave., between 49th and 50th Sts. $700,000. G. F. Womrath, supt.

Pa., Phila.—Bd. Educ., E. Merchant, secy. and bus. mgr., 19th and Ludlow Sts. bids about Apr. 24, 2 Junior High Schools, each 3 story, basement, 170 x 290 ft., rein-con., brick, steel, plain found., one at 59th and Malvern Sts., other at 23rd and Brown Sts.

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S. D., Yankton—Apr. 1, by G. W. Nash, pres. Yanktown College, (from selected list of bidders) 4 story, basement, brick, steel dormitories, campus. $150,000. G. G. Elmslie, 122 South Michigan Ave., Chicago, Ill., archt. Noted Mar. 12.

Ont., Alfred—A. J. Hazlegrove, archt., Ottawa, bids about Apr. 1, 2 story, basement, brick, rein.-con. industrial school, plain found., for Christian Brotherhood of Canada, Montreal, Que. $200,000.

CONTRACTS AWARDED

Calif., Altadena—Pasadena City School Dist., Eliot High School, 2 story, basement, brick, to E. F. Wopschall, 35 North Bway., Pasadena, $245,028. Noted Oct. 1.

Calif., Los Angeles—Bd. Educ. general contract University High School Auditorium, 2 story, 98 x 190 ft., brick, steel, tile, concrete, to J. F. Kobler, 932 South Simpson Blvd., $124,886; plumbing, to F. D. Reed Plumbing Co., 1573 East 23rd St., $6,062; heating and ventilating, to Cooney & Winterbottom, Inc., 2425 Hunter St., $19,200; electric wiring to Foulkes Electric So., 415 East 18th St., $7,990. Grand total $158,138. Noted Feb. 5.

Calif., San Francisco—University of San Francisco, Fulton and Stanyan Sts., 3 story, rein.-con. addition, Fulton St., to Barrett & Hilp, 918 Harrison St., $150,000.

Calif., San Francisco—L. P. Hobart, Crocker Bldg., brick, steel addition to Academy of Science Building, to Cahill Bros., 206 Sansome St., San Francisco, $250,000. Noted Feb. 5.

Conn., New Haven—Yale University, T. Farnum, constr. supt. divinity group, incl. Berkeley Divinity School, dormitories, class buildings, administration building, 9 connected dormitory structures, 5 class, 2 L-shaped buildings, basket ball, squash, handball facilities, all brick, stone, to Sperry & Treat, 294 Kimberly St. Est. $2,500,000. Noted Dec. 11.

Conn., Stamford—City, Bd. Educ., City Hall. altering and constructing 2 story, basement, brick, addition to Belltown School, concrete found., to T. J. Pardy Constr. Co., 1481 Seaview Ave., Bridgeport. Est. $150,000 or more. Noted Mar. 5.

Conn., West Haven (br. New Haven)—Town, School Bd., altering, and constructing 2 story, basement, brick, steel, to F. P. Sullivan, 127 Prospect St., East Haven, $114,854. Noted Feb. 12.

Ind., South Bend—Notre Dame University, general contract two 3 story, basement, rein-con. limestone dormitories, on campus, to Ralph & Sollitt & Sons, 518 East Sample St. Est. $850,000.

N. J., Ventnor (br. Atlantic City) — E. G. Perrot, archt., 1211 Arch St., Phila., Pa., general contract 3 story, basement, 80 x 115 ft., brick, steel school, 3 story, basement, 40 x 70 ft. convent, to Conneen Constr. Co., 770 South Schuylkill Ave., Phila., Pa. for St. James Roman Catholic Church. Est. $250,000. Noted Dec. 18.

O., North Lima—Mahoning Co. Bd. Educ., Youngstown, 2 story, basement, centralized school, to H. J. Richardson Co., Minerva, $145,199; plumbing, to Little Bros., 3931 Market St., Youngstown, $8,633; steam fittings, to Pitsch-Nilles Inc., 140 Cross St., Akron, $8,935. Grand total $162,767.

Ore., Medford—City, 2 story, basement, brick, steel school, Main St., to R. I. Stewart, Medford, $129,800; plumbing, to Coffeen Bros., Medford, $9,113; heating, to A. Schmeidli, Medford, $18,917; electrical work, to Dimitre Electric Co., 1549 Halsey St., Portland, $7,300. Grand total $165,130. Noted Feb. 19.

Ore., Portland—City, 2 story, basement, 133 x 240 ft., rein.-con. school, 55th and Prescott Sts., to R. B. Hammond Constr. Co., Pub. Serv. Bldg., $163,576; heating and ventilating, to A. G. Ruckligt & Co., Portland, $26,793, Sprinkling system, to Plumbing & Heating Sales Co., 170 East 6th St., $776; electrical work, to National Electric Co., 170 Thompson St., $4,500. Grand total $195,645.

Pa., Phila.—Bd. Educ., general contract 3 story, basement, 75 x 218 ft., rein.-con., brick, steel school, plain found., 12th and Columbia Sts., to P. Broz, 10 South 18th St., $341,209; heating, to A. McClintock Co., 5608 Race St., $44,275; plumbing, to J. Bugger, 2124 East Cumberland St., $23,123. Grand total $408,607.

Tex., Galveston — University Bd. Regents, Austin and Galveston, general contract, 5 story, part basement, 80 x 150 ft., brick, rein.-con., steel laboratory, plain found., to J. E. Morgan & Son, El Paso, $264,640; electric wiring, to Electric Constr. Corp., 209 South Pearl St., Dallas, $23,990; plumbing and heating, to Dixie Heating & Ventilating Co., 109-11 Fannin St., Houston, $62,352; equipment, to Welsh Mfg. Co., Austin, $36,768. Grand total $387,750. Noted Jan. 22.

Wis., Milwaukee—Bd. School Directors, concrete, cement work for Girl's Trade and Technical High School, to W. E. Gehring, 1890 12th St., $57,100; masonry, to J. Lorenz, 1624 Vleit St., $56,200; cut stone, to Andrews Stone & Marble Co., 110 Keefe Ave., $8,640; tile, to H. Neidner & Co., 519 East Water St., $13,412; terrazzo, to American Marble & Mosaic Co., 740 North Water St., $15,625; marble, to W. Salmon Marble Co., 1536 West Pierce St., $16,265—plaster, to W. Gregory & Sons, 848 Jackson St., $36,924; carpentry, to P. H. Cyriax, 1661 21st St., $42,840. Grand total $247,006. Noted Dec. 11.

Ont., Ottawa — English Oblate Fathers, 4 story, basement, 54 x 125 ft., rein.-con., brick, steel addition to St. Patrick's College, plain found., Echo Dr., to Doran Contg. Co., Queen St., $150,000.

THEATRES

PROPOSED WORK

Fla., Miami—Paramount Publix Theatres, Paramount Bldg., New York, theatre, Flager St. and 3rd Ave. To exceed $500,000.

Mass., Brookline (br. Boston) — Paramount Publix Theatres, Paramount Bldg., New York, bids latter part April, general contract theatre, Rapp & Rapp, 1501 Bway., New York, archts. Noted Feb. 19.

Mass., Martha's Vineyard—Rice Players, P. Rice, Clark St., Brookline, 1 story, basement theatre, Brewster Ave. $150,000. Architect not selected.

N. J., Newark—Warner Bros. Pictures, Inc., 321 West 44th St., New York, 1 story, basement, brick, steel, plain found., 878-90 Broad St. $1,000,000. **Maturity about December.** J. Eberson, 370 Lexington Ave., New York, archt. Noted Oct. 2.

N. J., Red Bank—Owner, c/o Bolyan & Levine, archts., 143 Albany St., New Brunswick, 2 story, basement, brick, steel theatre. $150,000. Project in abeyance. Noted Mar. 12.

N. J., Trenton—Warner Bros. Pictures, Inc., 321 West 44th St., New York ,sketches by J. Eberson, 370 Lexington Ave., theatre. To exceed $350,000. **Maturity after December.** Noted Mar. 27, 1930.

N. Y., New York—Todd Robertson & Todd Co., 347 Madison Ave., bids in June on separate contracts 10 buildings for Metropolitan Square (Radio City), 5th Ave. and 51st St., for John D. Rockefeller Jr. and Metropolitan Square Corp., 61 Bway. Est. $250,000,000. Reinhard & Hofmeister, 420 Lexington Ave., Corbett, Harrison & MacMurray, 420 Lexington Ave., and Raymond Hood, Godley & Fouilhoux, 40 West 40th St., archts. H. G. Balcom, 10 East 47th St., engr. in charge of structural design. Noted Dec. 25.

Tenn., Knoxville—Reliance Amusement Co., c/o Frank Dowler Co., 423 High St., Chattanooga, sketches theater, $500,000. Warner Bros., 321 West 44th St., New York, lessee.

BIDS ASKED

Mass., Boston—Mar. 23, by Terminal Theatre Co., N. Thompson, 312 Congress St., and Hendrick & Hayward, archts., 192 Boylston St., 1 story, basement, brick, granite, plain found., sect. of South Station, Dorchester Ave. and Summer St. To exceed $150,000. Noted Mar. 5.

Tex., Amarillo — Paramount-Publix Corp., Paramount Bldg., New York, taking bids general and separate contracts, brick, rein.-con., steel theater, 2,000 seating capacity, 30,000 sq.ft. floor space, plain found. $450,000. Private plans.

CONTRACTS AWARDED

Va., Newport News — Paramount Publix Theatres, Paramount Bldg., New York, theatre, to Smallman Constr. Co., 1109 5th Ave. S., Birmingham, Ala. Est. exceeds $300,000. Noted Oct. 9.

BANKS

PROPOSED WORK

Conn., New Haven—Connecticut Savings Bank, B. Mansfield, pres., plans by E. Swartout, 10 East 40th St., New York, bank addition, Crown and Church Sts. $150,000 or more. **Maturity after June 1.**

N. J., Red Bank — Merchants Trust Co., K. McQueen, 30 Broad St., bids after June 1, 6 story, basement, brick, steel, rein.-con. office, store, bank, Broad and Monmouth Sts. $500,000. Warren & Wetmore, 16 East 47th St., New York, archts. Noted Jan. 29.

BIDS ASKED

Mass., Weymouth—Weymouth Trust Co., 92 Pleasant St., taking new bids on revised plans by Harper & West, 92 State St., Boston, 1 story, basement, brick, stone, concrete, steel, concrete found., Washington St. corner Prospect St. $150,000. Former bids rejected. Noted Mar. 5.

N. J., Newark — A. Stanley Miller, archt., 1774 Carroll St., Brooklyn, N. Y., bids after Mar. 23, general contract 2 story, basement, brick, steel bank, Clay and Broad Sts., for Salvatore D'Auria & Son, 139 7th Ave., $150,000. Noted Feb. 26.

N. J., Paterson—Bway. Bank & Trust Co., 120 Bway., bids about Apr. 1, general contract 2 story, basement, brick, steel, bank, Bway. and West Bway. $150,000. H. B. Crosby & A. E. Sleight, 125 Ellison St., archts. Noted Feb. 19.

CONTRACTS AWARDED

N. J., Madison—Madison Trust Co., Main St., general contract 1 story, basement, brick, steel bank, 18-22 Waverly Pl., to J. W. Ferguson, 152 Market St., Paterson. Est. $150,000. Contractor taking bids on separate contracts. Noted Mar. 5.

OFFICES

PROPOSED WORK

Mo., St. Louis—Frank Building Corp., c/o Manhattan Dearborn Corp., 231 South La Salle St., Chicago, Ill., sketches by P. J. Bradshaw, 718 Locust St., 29 story, 100x193 ft., rein.-con., brick, stone, steel, 12th Blvd. from Oliver to Pine Sts. $2,500,000.

N. Y., New York—Corporation, c/o Lefcourt Constr. Co., 1619 Bway., 45 story office, Wall St. $6,000,000.

Offices (Continued)

BIDS ASKED

N. Y., New York—N. Rotholz, archt., 155 East 42nd St., taking bids on separate contracts 10 story store, office, Fordham Rd. and Grand Concourse, for C. Wagner, 687 East 132nd St. $1,200,000. Noted Feb. 19.

CONTRACTS AWARDED

Ind., Indianaplois—Grain Dealers Mutual Insurance Co., Guaranty Bldg., general contract 3 story, basement, 40 x 64 ft., rein- con., brick, stone, to W. P. Jungclaus, 825 Mass Ave. Est. $150,000. Noted Feb. 19.

Tex., Galveston—Gulf Colorado & Santa Fe R.R. Co., K. B. Duncan, ch. engr., Galveston, general contract 8 and 11 story, 76 x 181 ft., brick, rein.-con., steel, terra cotta additions, plain founds., to R. E. McKee, 1918 Texas St., El Paso. Est. $1,000,000. Noted Mar. 5.

STORES

PROPOSED WORK

Calif., Burlingame—Stelling & Gould, 155 Montgomery St., San Francisco plans by Bertz, Winter & Maury, 210 Post St., San Francisco, 1 story rein.-con. store, Luguna Ave. $150,000.

Calif., Hollywood—May Co., 801 South Bway., Los Angeles, 12 story, Class A department store, Wilcox Ave.

N. J., Newark—Owner, c/o E. A. McMurray, archt., 350 Milburn Ave., will not build 2 story, basement, brick, steel store, apartment, 18th and Melrose Aves. $200,000. Project abandoned. Noted Feb. 26.

N. J., Palisades Park — Owner, c/o P. J. Jossier, archt., 240 Broad St., will not build 2 story, basement, brick, steel store, apartment, Broad Ave. Project abandoned. $150,000. Noted Mar. 12.

Ont., Ottawa—S. S. Kresge Co. Ltd., Kresge Bldg., Detroit, Mich., 2 story, basement, 90 x 120 ft., brick, rein.-con., steel store, plain found., Rideau St. $200,000. Private plans.

Ont., Toronto—Merchandise Mart Syndicate, 204 Imperial Bank Bldg., 53 King St. W., plans by E. G. Bird, 53 King St. W., 21 story, basement, 195 x 314 ft., rein.-con., structural steel, brick, stone merchandise mart, York and Fleet Sts. $3,000,000 up.

BIDS ASKED

Mass., Waltham—See "Contracts Awarded."

N. J., Asbury Park—LeR. Godfrey, archt., Kinmouth Bldg., bids about Apr. 1, general contract 2 story, brick, steel store, office, Main St., for Sanford Flint, 1010 Corlies Ave. $150,000. Noted Mar. 5.

N. J., Orange—C. Messina, 152 North Day St. and Harris & Sohn, archts., 17 Mechanic St., Newark, taking bids 3 story, basement, brick, steel store, apartment, 52 North Day St. $150,000. Noted Mar. 12.

N. J., Perth Amboy — See "Contracts Awarded."

CONTRACTS AWARDED

Ill., Chicago—A. Epstein, archt., 2001 West Pershing Rd., general contract 2 story, basement, 60 x 170 ft., rein.-con., Indiana limestone brick, steel store, to Carlson & Erickson, 6054 Cottage Grove Ave. for Chicago City Bank & Trust Co., 815 West 63rd St. Est. $200,000. Noted Jan. 22.

Mass., Boston—H. Poorvu, 18 Tremont St., reconstructing 6 story, basement, 35x60x140 ft., brick, steel store, storage and loft building, plain found., 88 Pearl St., to M. Cohen, 486 Warren St., Roxbury. Est. $150,000.

Mass., Waltham—M. Connors & Sons, 5 Elson Rd., 3 story, basement, 80x150 ft., brick store, apartment, plain. found., West Main St., separate contracts. $150,000. W. Haines & Son, 32 Riverview Ave., archts.

N. J., Perth Amboy—Maple Realty Co., 169 Smith St., 2 story, basement, brick, steel store, office, plain found., Hobart St., separate contracts. $150,000. Former bids rejected. Greisen & Tuzik, 175 Smith St., archts. Noted Feb. 26.

O., Canton—Stark Dry Goods Co., S. Erlanger, mgr., 200 Tuscawaras Ave., 2 story, basement, 33 x 200 ft., brick, steel, concrete department store, to Warren-Hoffman Co., Witters Bldg. Est. $150,000. Noted Nov. 13.

Pa., Johnstown—H. M. Rogers, archt., Johnstown Trust Bldg., 5 story, basement, 93 x 127 ft., brick, steel, to Thiele Constr. Co., 826 9th St., for Glosser Department Store, Franklin St. Est. $250,000. Noted Mar. 12.

LOFTS

BIDS ASKED

N. J., Newark—Owner, c/o J. Centanni, archt., 142 Market St., bids about May 15, general contract 3 story, basement, brick, steel loft addition. $150,000.

PUBLIC

PROPOSED WORK

Conn., Windsor — LIBRARY — Windsor Historical Society, C. Chamberlain, chn. building comn., historical library. $150,000. Architect not selected.

Ind., Indianapolis—FAIR—State Bd. Agriculture, State House, E. J. Baker, secy., bids in April, 122 x 508 ft., brick, concrete fair grandstand building. $225,000 Kopf & Deery, 620 Pythian Bldg., archts.

Kan., Independence—COURTHOUSE and JAIL—Bd. Comrs. Montgomery Co., plans by Cuthbert & Suehrk, Topeka State Bank Bldg., Topeka, 3 story addition, incl. jail, sheriffs residence, jail equipment. $150,000.

Mass., Boston—MUNICIPAL—City, Dpt. P. Buildings, municipal building, Fields Corner Sect. $400,000. Architect not selected.

Mass., Brighton (br. Boston)—LIBRARY—City of Boston, Library Dpt., F. W. Buxton, chn. Bd. Trustees, Copley Sq., sketches by Kilham, Hopkins & Greeley, 9 Park St., Boston, 2 story, basement, brick, limestone branch library. $200,000. Noted Feb. 19.

Mass., Worcester — AUDITORIUM — City, Worcester Memorial Auditorium Comn., C. L. Allen, chn. building com., plans by L. W. Briggs & Co., 314 Main St., and F. C. Hirons, 40 East 49th St., New York, assoc. archts., brick, steel, stone memorial auditorium, Salisbury St. $2,000,000. H. G. Balcom, 10 East 47th St., New York, structural engr. C. R. Place, 420 Lexington Ave., New York, plumbing, heating, ventilating and electrical engr. Noted Mar. 13, 1930.

N. H., Boscawen—JAIL—Comrs. Merrimack Co., A. H. Britton, chn., 12 North Main St., Concord, jail. $150,000 or more. Architect not selected.

N. J., Paterson—JAIL and HALL of RECORDS—Bd. Freeholders Passaic Co., Court House, 8 story, basement, brick, steel county detention jail, hall of records, Grand St. between Spring and Jackson Sts. $3,500,000. Project in abeyance. H. B. Crosby, 1st Natl. Bank Bldg., archt. Noted Jan. 1.

N. J., Perth Amboy—FIRE HOUSE—Bd. City Comrs., City Hall, plans by Greisen & Tuzik, 175 Smith St., 3 story, basement, brick, steel, plain found. $150,000. Noted Feb. 26.

N. Y., Syracuse—COUNTY HOME—Onondaga Co., Court House, plans by M. L. Ring, Dennison Bldg., constructing men's dormitory, new laundry, and installing 5 sprinklers in women's dormitory. $430,000.

Pa., Franklin—COURT HOUSE—Bd. Comrs. Venango Co., Z. Smiley, clk., Court House, sketches by W. H. Crosby, Beers Bldg., Oil City, 2 story, basement, stone, Elk St. $150,000.

R. I., Providence—FIRE STATION—City, Dpt. P. Buildings, sketches by T. J. H. Pierce, City Hall, fire station, Reservoir Ave. and Roger Williams Park. $150,000.

BIDS ASKED

N. J., Newark — FIRE HOUSE — Bd. City Comrs., City Hall, bids about Apr. 1, 3 story, basement, brick, steel, 18th Ave. and Norwood St. $150,000. F. Grad, 1023 Broad St., archt.

N. Y., Attica—PRISON—Mar. 31, by Dpt. Correction, State Office Bldg., Albany, administration building, hospital, laundry and bath building, state shop, shop building, textile shop, maintenance storehouse, prison wall addition, and service connections at Attica State Prison. Former bids rejected; adv. E. N.-R. Mar. 19. Noted Jan. 22.

N. Y., New York—MUSEUM—Mar. 24, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, general contract South Oceanic Wing, at American Museum of Natural History, Manhattan Sq. Former bids rejected. Noted Jan. 15.

R. I., East Providence (br. Providence)—FIRE STATIONS—Mar. 30, by Town, Building Com., 2 fire stations, Central Station 1 and Rumford Dist. Station 3, brick, steel, plain founds, $150,000; heating, plumbing and electrical work in both stations, est. $25,000 M. Traficante, 175 Taunton St., archt. Noted Feb. 19.

CONTRACTS AWARDED

N. J., Menlo Park—SOLDIERS HOME—Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract infirmary, at New Jersey War Veterans Home to Gaster-Falco Co., 656 1st St., Elizabeth. Est. $129,000. Noted Mar. 6 Daily.

B. C., Vancouver—EXHIBITION—City, general contract 1 story 160 x 380 ft., rein-con. plain found., Hastings Park, to Snider Constr. Co. Ltd., 637 Granville St., $103,444.

Que., Montreal — MARKETS — City, reconstructing St. Antoine Market, to Duranceau & Duranceau Ltd., 5847 Hamilton St., $348,900; reconstructing St. James Market, to E. G. M. Cape Ltd., 620 Cartheart St., $248,689.

Que., Montreal—RESTAURANT—City, constructing restaurant on top of Mount Royal, to St. George Cartage & Constr. Co. Ltd., 4820 4th Ave., Rismont, Montreal. $192,298.

UNCLASSIFIED

PROPOSED WORK

Ill., Chicago—HISTORICAL HOME—Chicago Historical Society, 632 North Dearborn St., plans by Graham, Anderson, Probst & White, 80 East Jackson Blvd., 2 story, basement, red brick, limestone or marble, incl. library, museum, on 175 x 300 ft. site, in Lincoln Park, North Ave. and Clark St. $500,000. Noted Nov. 7, 1929.

N. H., Concord—HOME—New Hampshire Odd Fellows, H. Davis, chn. building, com., sketches by J. E. Richardson, 56 Grove St., Dover. Odd Fellows Home, Pleasant St. $150,000 or more.

N. J., Hopatcong—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., Newark, sketches by H. B. Brady, Inc., 333 North Broad St., 2 story, basement, brick, steel. $150,000.

N. J., Neteong—EXCHANGE—New Jersey Bell Telephone Co., 540 Market St., Newark, sketches by H. B. Brady, Inc., 333 North Broad St., Elizabeth, 1 story, basement, brick, steel. $150,000.

N. J., Newark — FARMERS MARKET — Newark Farmers Market, Inc., G. Haines, vice pres., 1218 Broad St., sketches by J. Diehl, 39 North 9th St., fifty 1 story, 20 x 60 ft., brick, steel, rein-con. building, Lister, Albert and Euclid Ave., Cornelia, Catherine and Joseph Sts. $400,000. Noted Mar. 12.

N. J., Newark—MARKET—Steuben Holding Corp., 60 Park Pl., will not build 2 story, basement market, Washington and Linden Sts. $200,000. Project abandoned. F. H. Koenigsberger, 48 Walnut St., archt. Noted Feb. 5.

N. J., Newark—RAILROAD STATION—T. J. Skillman, ch. engr. Broad St. Sta., Phila., Pa. railroad station. **Maturity in June or later.** Park Ave., New York, archts. L. P. Strubel, McKim, Meade & White, 101 Park Ave., New York, archts. L. P. Strubel, c/o owner in charge. Noted Oct. 23.

N. J., Plainfield—EXCHANGE—New Jersey Bell Telephone Co., 132 West 2nd St., brick, steel, Park Ave. and West 5th St. $150,000. **Maturity in August.** Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted Dec. 11 Daily.

N. Y., New York—RESTAURANT—William Childs, c/o "Old Algiers," Bway. and 102nd St., plans by Pruitt & Brown, 342 Madison Ave., restaurant, 130 West 42d St. To exceed $400,000.

N. Y., Saratoga Springs—LABORATORY—New York State, c/o Saratoga Springs Comn., Albany, revised sketches laboratory, $500,000; drink hall, $900,000; recreational facilities, golf links, tennis courts, gymnasium and landscaping, $250,000; mineral water bottling plant, $300,000; remodeling baths, $100,000. **Maturity late in April** Noted Jan. 15, under "Unclassified."

Que., St. Hyacinthe—EXHIBITION—La Cie d'Exposition Regionale de St. Hyacinthe, A. Morin, secy., c/o Dairy School, 3 or more pavilions. Architect and engineer not selected. **Maturity in June.**

BIDS ASKED

Mass., Brighton—HOME—Mar. 25, by Mowll & Rand, archts., 21 School St., Boston, 2 story, basement, brick, stone addition, plain found., 10 Pertshire Rd., for Florence Crittendon League of Compassion, Inc., L. Higgins, 88 Tremont St., Boston, chn. Building Com. $150,000. Noted Feb. 5.

O., Cincinnati—STATION—Mar. 23, by Cincinnati Union Terminal Co., Temple Bar Bldg., 1 to 6 story, 350 x 720 ft., rein-con., stone, passenger station, incl. dome, 125 ft. high, west of Lincoln Park. $5,000,000. Fellheimer & Wagner, 155 East 42nd St., New York, archts. Noted Dec. 4.

CONTRACTS AWARDED

Sask., Regina — EXHIBITION — Regina Exhibition Assn., 120 x 640 ft. main section with two 120 x 300 ft. wings, concrete, steel, stucco exhibition building for World's Grain Show, 150,000 sq.ft. floor space, to Carter-Halls-Andinger Co. Ltd., 510 West Hastings St., Vancouver, B. C., $179,469. Sub-let contracts for millwork, to Western Mfg. Co. Ltd., Regina; electrical work, to Sun Electric Ltd., Regina; structural steel, to Dominion Bridge Co. Ltd., Winnipeg, Man. Noted Sept. 11.

Sask., Regina—POSTAL and TELEGRAPH—Canadian Pacific R.R., J. M. R. Fairbairn, Montreal, Que., ch. engr., 2 story 50x180 ft., steel, stone postal and telegraph building, to Bird, Woodall & Simpson, 2130 Albert St., $200,000.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Los Angeles — FACTORY — P. Grassi Travertite Wks., 1945 San Bruno Ave., San Francisco, sketches factory. To exceed $60,000.

Calif., Berkeley—CREAMERY—G. R. Heath, 2930 Garber St., sketches rein.-con., San Pablo Ave. $100,000. Private plans.

Calif., Oakland—GLASS FACTORY—Owens-Illinois Glass Co., W. I. Cole, mgr., 133 Kearny St., San Francisco, sketches glass factory. $1,000,000. Engineering Department of Owners, engrs. H. Barnard, Toledo, O., ch. engr.

Calif., Sausalito—BOAT BUILDING PLANT—Enterprise Boat Building Co., 1355 Bush St., San Francisco, sketches 2 story, concrete plant, 260 ft. long. $40,000. Architect not selected.

Miss., Natchez — FACTORY — Mississippi Match Co. soon lets contract factory. $80,000. N. W. Overstreet, Jackson, archt.

N. J., Allwood — PLANT — Amer. Colortype Co., 207 West 25th St., New York, sketches by Ballinger Co., engrs. and archts., 100 East 42nd St., New York, altering and constructing, $40,000 or more.

N. J., Newark—REPAIR DEPARTMENT—Bd. Educ., City Hall, 5 story, basement, brick, steel repair department building, Coes Pl. and Marshall St. $200,000. **Maturity probably in June.** Architect not selected. Noted Feb. 5.

N. J., Newark — DISTRIBUTION PLANT — S. S. Kresge Co., Kresge Bldg., Detroit, Mich., bids probably late in fall on revised plans distribution plant. $50,000. Abbott-Merkt & Co.,

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Factories and Mills (Continued)

175 5th Ave., archts. and engrs. Noted July 25.

N. J., Paterson — SILK MILL — Canova & Simone Silk Co., 182 Cedar St., will award contract in April, silk mill. To exceed $40,000. Bids in. Lockwood, Greene & Co., Pershing Sq., New York, engrs.

N. Y., Brooklyn — BOTTLING PLANT — F. and M. Schaefer Brewing Co., Kent Ave. and 10th St., bottling plant addition. $100,000. **Maturity latter part April.** Waldemar Montenson, 103 Park Ave., New York, archt. Noted Mar. 5.

N. Y., Jamaica — MANUFACTURING — Aluminate Co., 135-26 Hillside Ave., sketches by H. J. Jeffery, Jr., 90-50 Parsons Blvd., manufacturing plant, 132nd St. and 91st Ave. $40,000.

N. Y., Rockaway Beach—GAS GENERATOR —Queensboro Gas & Electric Co., 1610 Central Ave., Long Island City, plans by C. L. Phillip & Co., c/o owner, 37 x 59 ft. gas generator, Beach Channel Dr. and Beach 108th St. $40,000.

N. Y., Saratoga Springs—BOTTLING PLANT —See "Buildings—Unclassified."

N. Y., Syracuse—PLANT, etc.—National Biscuit Co., 449 West 14th St., New York, plans by L. Wirsching, Jr., 449 West 14th St., 1, 2 and 3 story, 170 x 330 ft., brick, steel, concrete plant, distribution stations. $400,000. **Maturity latter part April.**

Pa., Emsworth—DAIRY PLANT—Haggart & Culler, archts., State Theater Bldg., Pittsburgh, soon lets contract 1 and 2 story, concrete, brick, Camp Horne Rd., for Otto Suburban Dairy, R. A. Otto, in charge, Camp Horne Rd. $40,000.

Pa., Pittsburgh—MANUFACTURING—Smith Faris Co., 1150 Hodgkiss St., soon lets contract 1 story, 26 x 83 ft., brick, steel, 1159 Hodgkiss St. $40,000. Private plans.

Texas—CITRUS PACKING PLANTS—Texas Citrus Fruit Growers Assn., Brownsville, brick, rein.-con., at Santa Rosa and Harlingen. $100,000 each. Private plans.

Tex., Harlingen—CANNING PLANT—Walker Craig Co., c/o P. S. Dougherty, 5-7 Front St., Brownsville, 1 story, brick, rein.-con, concrete found. Private plans.

B. C., Burnaby — ASSEMBLING PLANT — Ford Motor Car Co. of Canada Ltd., W. R. Campbell, pres., 1160 Hamilton St., Vancouver, assembling plant. $1,000,000. Private plans.

B. C., Victoria—SAW MILL—Cameron Lumber Co. Ltd., Victoria, rebuilding saw mill, recently destroyed by fire, at Inner Harbor. $200,000 incl. machinery. Private plans.

Ont., Goderich—PACKING PLANT—Huron County Fruit Growers' Assn., 4 story, fruit packing and cold storage plant. $100,000. E. H. Darling, 36 James St. S., Hamilton, engr.

Que., Montreal — LAUNDRY — Notre Dame Hospital, Sherbrooke St., soon lets conctract, 3 story, 51 x 194 ft., structural steel laundry, power and male help building. $180,000. L. A. and P. C. Amos, 1414 Crescent St., archts.

Que., Montreal—MANUFACTURING—Hackbridge Electric Constr. Co. Ltd., Walton-on-the-Thames, England, C. H. W. Biskeborn, vice-pres., transformer and rectifier manufacturing plant.

BIDS ASKED

Ind., Eaton — FACTORY — See "Contracts Awarded."

N. J., Lodi—DYE PLANT—C. V. R. Bogert, archt., 210 Main St., Hackensack, taking bids (selected list bidders) general contract 1 story, basement, 88 x 140 ft. dye plant and service building, Main St. and Arnot Pl., for United Piece Dye Wks., Nicholson St. $40,000.

N. J., North Bergen — CONCRETE BLOCK PLANT — E. J. Decker, 300 29th St., Woodcliff, taking bids rebuilding 3 story, basement, brick, steel, rein.-con., 5274 Hudson Blvd. $40,000. F. J. Ricker, 685 Hudson Ave., West New York, archt.

N. Y., Ossining—LAUNDRY, etc.—Apr. 19, by Dpt. Correction, Municipal Bldg., New York, laundry and bath building, Sing Sing Prison; adv. E.N.-R. Mar. 19.

N. Y., West New Brighton (sta. Staten Island) — LAUNDRY — C. Strohmeyer, archt., 81 Sturgess St., Port Richmond, taking bids general and separate contracts 1 story, basement, brick, steel laundry addition, Clove Rd., for Blue White Laundry Co., 685 Cary Ave., Port Richmond. $40,000.

Tex., Brownsville — CITRUS PACKING PLANT — Texas Citrus Fruit Growers Assn., Brownsville, soon takes bids 2 story, 100 x 200 ft., rein.-con., brick. $100,000. Private plans. Noted July 10.

Tex., Houston—FACTORY, etc.—Mar. 26, by Southwestern Can Co., c/o H. O. Westward, vice-pres., 1207 Mary St., 3 story, 1st floor 180x375 ft., 2nd floor 101x180 ft., and 3rd floor 46x51 ft., steel, concrete factory, office, Greenwood St. near Canal. J. Finger, 711 Natl. Standard Bldg., archt. W. P. Moor, Kress Bldg., consult. engr.

Wash., Seattle—LAUNDRY, etc.—V. W. Voorhees, archt., Lloyd Bldg., bids about June 2, 2 story, basement, 180 x 256 ft., rein.-con., brick, terra cotta laundry, power plant, 11th and Marion Sts., for Empire Laundry. $200,000.

CONTRACTS AWARDED

Calif., Maywood—FACTORY—Jaeger Furniture Mfg. Co., 6000 South Boyle Ave., Huntington Park, 1 story, timber, corrugated iron, East Slauson Ave., to W. J. Moran, 324 West 48th Et., Los Angeles, exceeds $60,000.

Calif., Modesto — BAKING PLANT — San Joaquin Baking Co., L and Los Angeles Sts., Fresno, part 1 and 2 story, brick, 10th and Needham Sts., to **H. Tennyson**, 125 Poplar St., $50,000. Owner expending $15,000 for equipment.

Ill., Chicago—PACKING PLANT—Buehler Bros., 1400 West 46th St., masonry and carpentry contract 2 story, 83x99 ft. addition, 1414-20 West 46th St., to H. Erickson Co., 228 North La Salle St. Est. $60,000.

Ill., Chicago—PLANT—Washburn Crosby Co., Chamber of Commerce Bldg., Minneapolis, Minn., masonry, carpentry contract 3 story brick manufacturing and storage plant, 104th St. and Calumet Ave., to Jacobson Bros., 53 West Jackson Blvd., $40,000.

Ind., Dale—PLANT—Kraft Phoenix Cheese Co., general contract 55 x 110 ft., rein.-con., brick, steel, to A. Ryan, Dale. Est. $40,000. Noted Jan. 29.

Ind., Eaton—FACTORY—Elmer Butterfield, rein.-con. brick, steel, hollow tile factory, day labor, $40,000. Private plans.

Ind., Liberty—PLANT—T. A. McCoy, brick, steel mill and grain plant. $40,000. Owner builds. Bacon & Tislow, Architects Bldg., Indianapolis, archts.

Ind., Michigan City—DAIRY PLANT—Scholl Dairy Co., general contract 2 story, 101 x 150 ft., brick, steel, stone plant, incl. bottling, receiving and pasteurizing rooms, 10-30 East Michigan St., to Tonn & Blank, 93 North Franklin St. Est. $60,000.

N. Y., Brooklyn—ICE PLANT—Williamsburg Ice Co., altering and constructing 2 story addition, Ten Eyck St. and Bushwick Ave., to Cooling Tower Co., 15 John St., New York.

N. Y., Brooklyn — ABATTOIR — United Dressed Beef Co., 780 1st Ave., New York, altering and constructing abattoir addition, Johnson Ave. and Bogart St., to Wiener & Levine Constr. Co., 55 West 42nd St., New York. Est. $40,000.

N. Y., Fairport—PLANT—Trescott Co., 1½ story, 60 x 120 ft. steel, brick, to C. M. Lombard, Fairport. Est. $40,000.

N. Y., New York — CARPET CLEANING FACTORY — One Hundred Thirty-Five East 144th Street Corp., P. B. Williams, pres., 353 West 54th St., carpet cleaning factory, to P. Sterling, 230 Park Ave. Est. exceeds $40,000. Noted Feb. 19.

Ont., Copperciffe—METALS SEPARATION PLANT—International Nickel Co., Copperciffe, general contract for structural steel, concrete, precious metals separation plant, to Fraser-Brace Eng. Co., 107 Craig St., Montreal, Que.; 3,500 tons structural steel, to Dominion Bridge Co., Lachine, Que. Est. $1,000,000.

Ont., Leaside—FACTORY—Themco Mfg. Co. of Leaside, 2 story, brick, steel, to Gatehouse Bros. Ltd., 77 Victoria St., Toronto, $30,000. Noted Jan. 1, 1930.

Que., St. Hyacinthe—HAIRPIN FACTORY—Hump Hairpin Co., 1918 Prairie Ave., Chicago, Ill., general contract 2 story, basement, 234 ft. long, 80x120 ft. wide, brick, steel, to Dakin Constr. Co. Ltd., Belmont St., Montreal. Est. $80,000-$90,000. Noted Mar. 12.

GARAGES

PROPOSED WORK

Mass., Hingham—Town, W. L. Foster, chn. Bd. Selectmen, sketches by L. Foster, 6 Middle St., 1 story, concrete garage, storage building. $40,000.

Mass., Quincy—Corey Bros., 12 Shaw St., 1 story, 60 x 100 ft., brick, concrete, steel, rein.-con. public garage, concrete found., 756 Washington St. $50,000. Private plans. Noted Dec. 4.

Mass., Watertown — Town, Bd. Selectmen, municipal service garage. $75,000. Architect not selected.

N. J., Metuchen — Owner, c/o A. M. Korff, archt., 203 Park Ave., Plainfield, will not build 2 story, brick, steel bus terminal. Project abandoned. Noted Feb. 12.

N. J., Union City—Owner, c/o J. G. Helmers, archt., 147 Summit Ave., will not build 2 story, basement, brick, steel, rein.-con. garage, 14th St. $150,000. Project abandoned. Noted Feb. 26.

N. Y., Brooklyn—Long Island R.R. Co., A. C. Watson, ch. engr., Pennsylvania Station, New York, plans by F. H. Klie, 250 Park Ave., New York, service garage, Ocean Ave. and Avenue H. $60,000.

N. Y., Flushing — Faw Realty Corp., 1810 Myrtle Ave., Ridgewood, sketches by H. Bruckner, 1037 Kossuth Pl., Glendale, service garage, Lawrence St. and Avery Ave. $40,000.

Pa., Oil City — Owner, c/o J. H. Hicks, archt., 701 Palace Hardware Bldg., Erie, 1 story, 42 x 42 x 32 x 32 ft., brick, stone super-service station, incl. garage, office, battery station, wash rack, greasing pit, brick and tile found. $40,000. Owner purchases floodlighting and electric sign equipment.

BIDS ASKED

Conn., Waterbury—Kaplan Bros., 352 East Main St., taking bids 1 story, basement, 60 x 115 ft., brick, steel garage and sales building, concrete found., East Main St. $40,000. T. M. Freney, 51 Leavenworth St., archt. Noted Feb. 5.

N. Y., Brooklyn—Goal Service Station, Inc., 478 Leonard St., taking bids general and separate contracts service garage, Engert Ave. and Leonard St. $40,000. H. J. Nurick, 44 Court St., archt.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., bids about May 1, general contract garage and service building, Fordham Hospital. $40,000. B. R. Swartburg, 2 West 45th St., archt.

CONTRACTS AWARDED

Ind., Hobart — Phillips Petroleum Co., 310 South Michigan Ave., Chicago, Ill., general contract brick, steel, stone super-service station, 3rd and Wisconsin Sts., to E. McCown, 3880 Maryland St., Gary. Est. $40,000.

Pa., Grove City—Sterling Oil Co., R. S. Newton, in charge, Emlenton, 1 story, iregular sized brick, hollow tile super-service station, to Smith Constr. Co., Grove City. Est. $40,000.

Wis., Milwaukee—G. W. Hirth Co. (owner, archts. and general contractors) 727 West Chambers St., will build 1 story, basement, 24 x 110 x 123 ft. garage, Hubbard St.; structural steel, to C. Hennecke, 1353 North Pierce St.; steam heating, to E. A. Knab, 4421 North Cramer St.; electrical work, to S. M. Gill, 1206 7th St.

POWER PLANTS

PROPOSED WORK

Ind., West Lafayette (br. Lafayette) —Perdue University, R. B. Stewart, comptroller, bids latter part month rein.-con., brick power plant, $100,000. W. Scholer, 210 Wallace Bldg., Lafayette, archt. Noted Feb. 12.

Ky., Mt. Sterling—City power plant. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Mass., Martha's Vineyard—Cape and Vineyard Electric Co., P. H. House, supt., power plant addition. $40,000. Associated Gas & Electric System, A. Golden, 46 Blackstone St., Cambridge, engr. Noted Dec. 11.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., plans by W. H. Gompert & K. M. Murchison, 101 Park Ave., boiler stack and boiler house addition, at City Home, Welfare Island, opposite 67th St. $85,000. Noted

O., Franklin—City, power plant. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

BIDS ASKED

Ariz., Tucson—See "Contracts Awarded."

D. C., Wash.—Apr. 9, at office D. Lynn, archt. of Capitol, steam distribution system, from Capitol Power Plant, E St., to certain government buildings adjacent to Capitol, incl. concrete ducts, tunnels; adv. E. N.-R. Mar. 19.

N. Y., Brooklyn—Mar. 27, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, constructing Jay and Smith Street Substations, for part of Rapid Transit R.R.

CONTRACTS AWARDED

Ariz., Tucson—Tucson Gas, Electric Light & Power Co., power plant improvements, enlargements, cooling tower, day labor and separate contracts. $500,000. S. Headman, Tucson, engr. Noted Dec. 11.

Mass., Boston—Edison Electric Illuminating Co., 39 Boylston St., concrete found. for a 1 story, brick, steel, rein.-con. steam heating plant, Kneeland St., to Gow & Co., Park Sq. Bldg. Noted Feb. 19.

N. Y., New York—R. C. Patterson, Jr., comr. Dpt. Correction, Municipal Bldg., power plant and electrical work at Rikers Island Penitentiary, East River, to Erickson Equipment Co., 452 Lexington Ave., $337,400 and $448,000 respectively; plumbing to E. V. McGovern, 251 East 66th St., $852,000. Grand total $1,637,800. Noted Dec. 5 and Mar. 3 Dailies.

Ont., Merritton—Dpt. Rys. & Canals, Ottawa, furnishing, installing surge tank, penstock, breeching and connections for hydro-electric power plant, to Horton Steel Wks. Ltd., Bridgeburg., $103,104.

WAREHOUSES

PROPOSED WORK

La., Lake Charles—Compress & Warehouse Co. soon lets contract, four 110x200 ft., steel frame warehouses (cotton), $75,000. R. J. Cummings, Bankers Mortgage Bldg., Houston, Tex., engr.

Mass., Cambridge—W. H. Crane, 1 Haywood St., 1 story, 60 x 200 ft., brick, concrete storage, Binney and Rogers Sts. $45,000. Private plans.

N. Y., New York — New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., St. Johns Park Freight Terminal Spring, Washington and Clarkson Sts. $15,000,000. **Maturity latter part April.** F. A. Dougherty, c/o owner, archt.

N. Y., New York—One Hundred Thirty-Seven East 57th Street Corp., B. S. Wiel, pres., 295 Madison Ave., plans by Thompson & Churchill, 19 West 44th St., New York, 6 story, storage, store, office, 700 Lexington Ave. $150,000.

BIDS ASKED

Conn., Greenwich—Mar. 25, by Drinkwater Sons, Inc., 122 Railroad Ave., (selected list bidders), 6 story, 50x90 ft., brick, rein.-con. warehouse, Railroad Ave. $125,000. Fletcher-Thompson, Inc., 1336 Fairfield Ave., Bridgeport, archts.

CONTRACTS AWARDED

Okla., Oklahoma City—Atchison, Topeka & Santa Fe R.R. Co., 80 East Jackson Blvd., Chicago, Ill., G. W. Harris, ch. engr., 2 story, 70 x 140 ft., coffee warehouse, brick plain found., 12th St., to C. M. Dunning, 605 North Hudson St., $70,000.

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See proposal advertising on page 117